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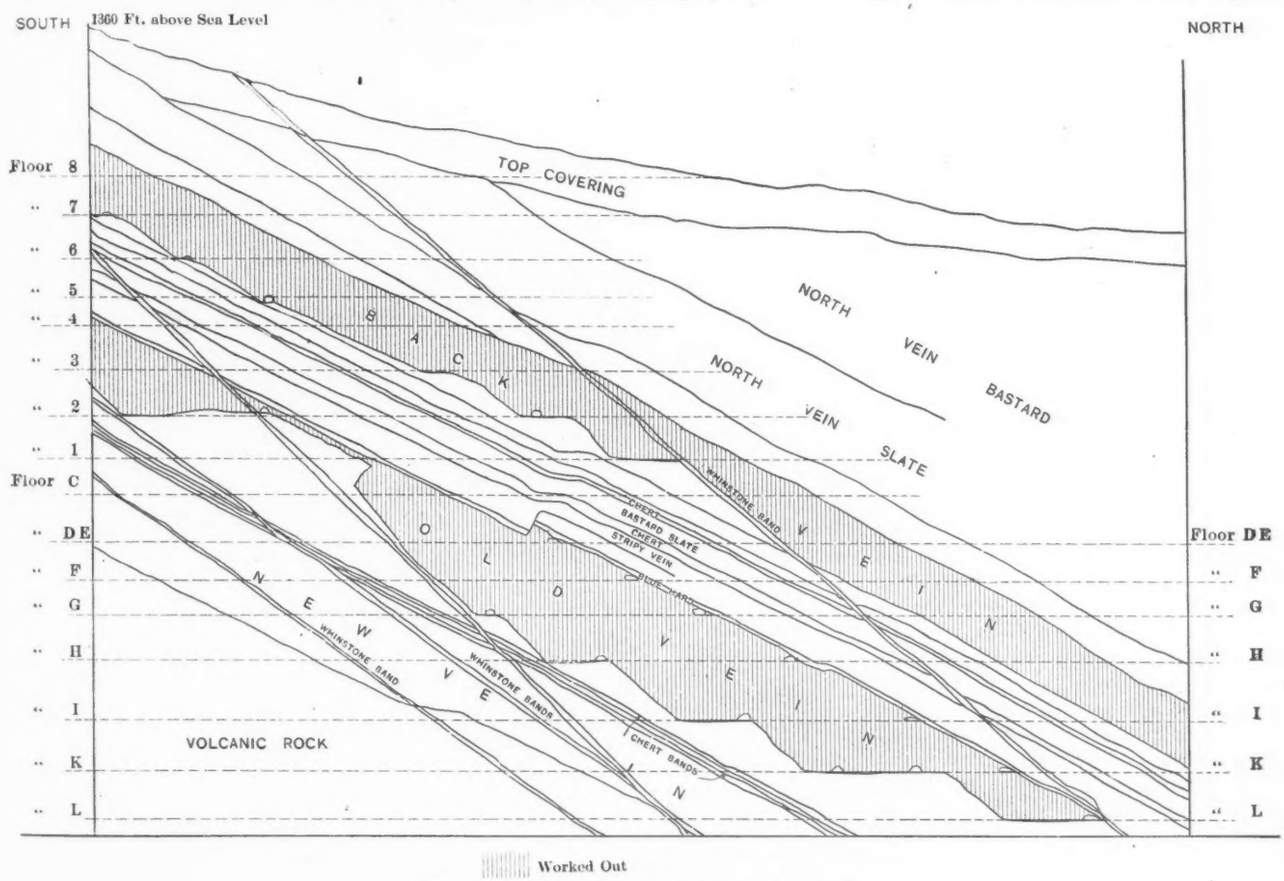
Slate Mining in Wales and Cause of Its Decline

The Oakeley Mine Is Operated by Modern Methods and at Reduced Capacity, but has a Full Year's Output Unsold

SPECIAL CORRESPONDENCE

Slate mining in Great Britain has fallen on evil days. There are a good many reasons for this unfortunate state of things: (1) the building trade generally is much less active than formerly; (2) the use of tiles is increasing in many districts; (3) some of the countries which formerly were buyers have put up tariff walls to stimulate their home industries; (4) the French producers have now got a firm footing in Great Britain, and the English and Welsh mines and quarries are subjected to a keen foreign competition in the home markets. These French slates are of good quality and low in price. As an example of their popularity I may mention that a church in North Cornwall has recently been roofed with them in spite of the fact that the celebrated Delabole quarries are only two miles away.

The opportunity for French and other foreign slates to enter the British home market was the great strike at the Penrhyn quarries some years ago. For two years these quarries were at a standstill, and the absence of their output, about 10,000 tons a month, from the market, gave the other Welsh producers the opportunity of putting up prices. The natural reaction occurred. Slate buyers, restive at the high prices, looked out for other sources. French, German and American slates were tried, but only the first named could compete in price and quality with Welsh slates. Subsequently, when the Penrhyn quarries reopened, the prices went down. With French slates still a factor on the market, the demand for Welsh slates never recovered. This fact, together with the other reasons mentioned, accounts for the production of Welsh slates being at the present time only one-half of what it was ten or fifteen years ago. The French slates are really of very good quality. They come from the district of Angers on the Loire. They are mined from depth, as are the slates from the Oakeley mines, described in this article, so that the cost of production is higher than if the source was an open quarry. Nevertheless the surroundings of the workmen, as regards food supply and climate, are so much superior in France that the cost of production is very much less than in Wales.



VERTICAL SECTION, OAKELEY SLATE MINE, WALES

Conditions Unfavorable to Efficient Labor.

To be quite candid, the districts in Wales where slate is found, though strikingly beautiful to the tourist in fine weather, are, year in and year out, bleak, chilly and

damp places to live in. There is a good deal of lung trouble prevalent and the climate is far from bracing. The same may be said of Cornwall. Both in Wales and Cornwall there is a depression and drowsiness which dampens the spirits and prevents a man from "hustling round" or "getting a move on him."

Since the new law came into force this year making employers responsible for all accidents and illnesses contracted by employees in the course of their duties, the Welsh slate miners have endeavored to bring their diseases of the lungs among the illnesses recognized by the law, alleging that the particles of slate dust are the cause of the disease. The employers have successfully combated this contention and have convinced the Board of Trade that the lung troubles are due not to the nature of the employment but to the unhealthy climate and the absence of ventilation and other sanitary precautions in the miners' homes. I believe, however, that we have not yet heard the last of the effect of slate dust on the encouragement of the growth of disease.

There is another point in connection with the economic question in the Welsh slate trade that requires some notice. I mean the trouble arising from the mutual distrust of the English and Welsh races. The Welsh object to the English because they are the hereditary invaders and the English return the compliment by taking every opportunity of calumniating the personal honor of the Welsh race. Anything which savors of meanness, incompetence, perjury, or immorality is said to be "Oh, quite Welsh!" as if the same weaknesses of human nature were not just as abundant in the towns and country in England.

This want of trust in the two races does great harm when the English are the employers and the Welsh the employed. It was the cause of the disastrous strike at the Penrhyn slate quarries where the owner Lord Penrhyn and his manager Mr. Young were hopelessly out of sympathy with the Welsh population which worked the quarries. No doubt Lord Penrhyn and Mr. Young were theoretically right in the dispute, but they distrusted the Welsh workmen so much as to be unable to distinguish between sympathy and weakness. In notable contrast was the method of the late William Roberts, manager of the Oakeley quarries, when dealing with disaffection. His firm but fatherly manner had an excellent effect.

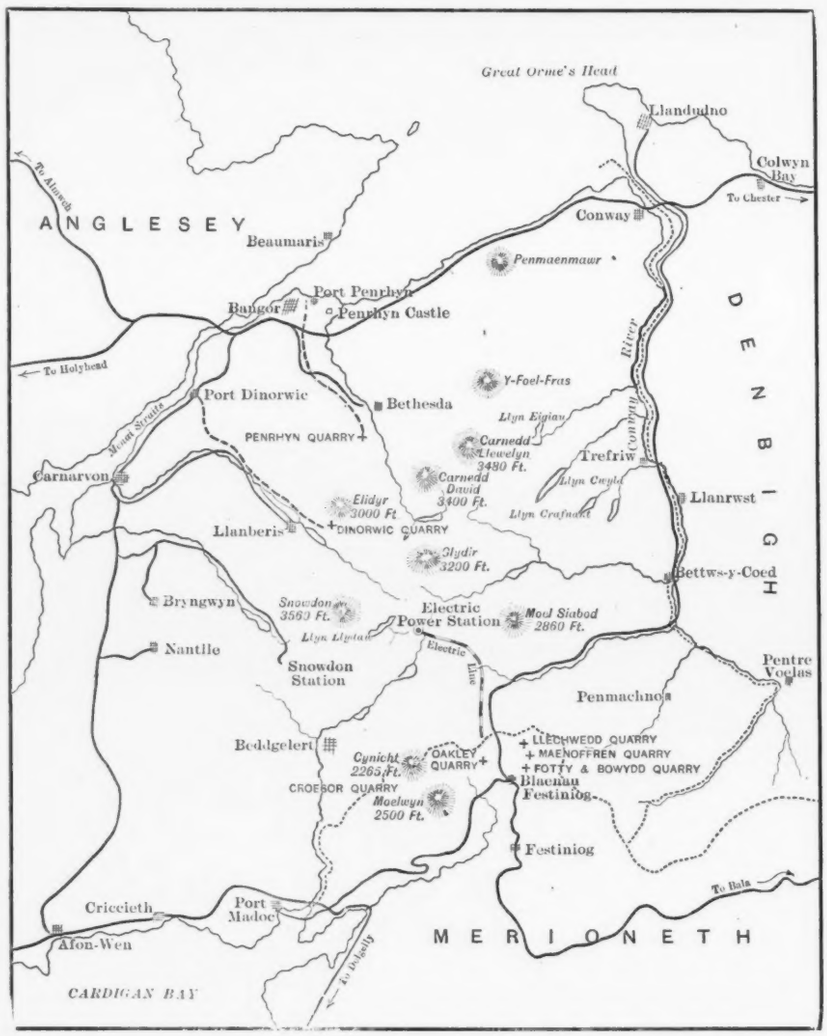
Slate Mines and Quarries

It is late in the day to be writing of the methods of slate mining in Wales. The subject is admirably treated in D. C. Davies' book, and little new has been introduced since its publication. The industry at the present time is centered at the Penrhyn and Dinorwic quarries, where the work is open-cut, and at Festiniog where most of the slate is won from underground. These districts and the chief individual workings are shown in the accompanying map.

There are in addition many quarries that are worked on a small scale or are now entirely abandoned in other districts, such as Nantlle near Carnarvon and Corris near Dolgelly. Slates of coarser texture are also worked in the Llangollen district. The Penrhyn quarries are worked independently of all others, as also are the Dinorwic quarries, belonging to Mr. Assheton Smith. Their output is at present about 5000 tons of slates a month, each. Neither presents any recent novelty in operation and requires no notice here.

On the other hand the Festiniog group of producers can show that they are doing their utmost to move with the times. The various companies have formed an association for the purpose of studying markets, methods of working, and pushing their interests generally. One notable feature is the ready interchange of ideas. If one of the mines is trying a new machine, all the managers of the other mines are invited up to inspect.

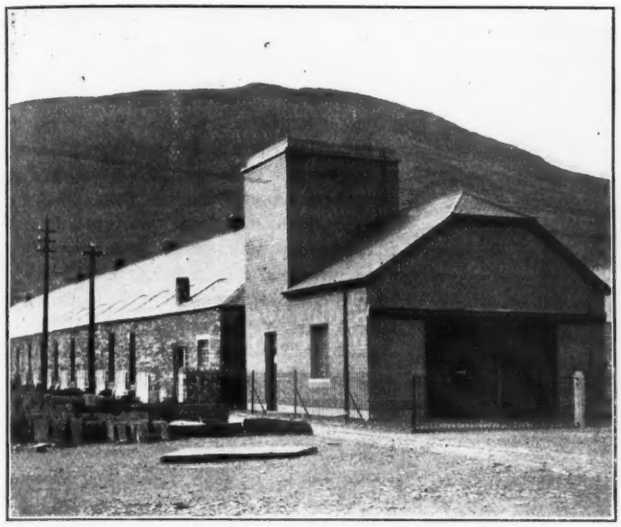
By far the most important of the Festiniog mines is the Oakeley. The Llechwedd, belonging to J. W. Greaves, is a large producer, as also are the Maenoffren and Votty and Bowyd. The Croesor mine is not such a large producer as some of the others, but it has a distinguished manager, Moses Kellow, who has recently put up an efficient electric power plant driven by water power. This plant he has described in a paper read before the Institution of Civil Engineers.



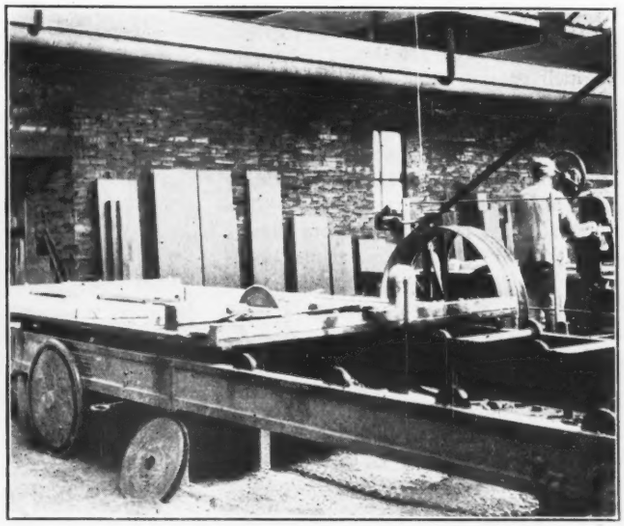
MAP OF PORTION OF WALES, SHOWING LOCATION OF SLATE MINES

The Oakeley Mine

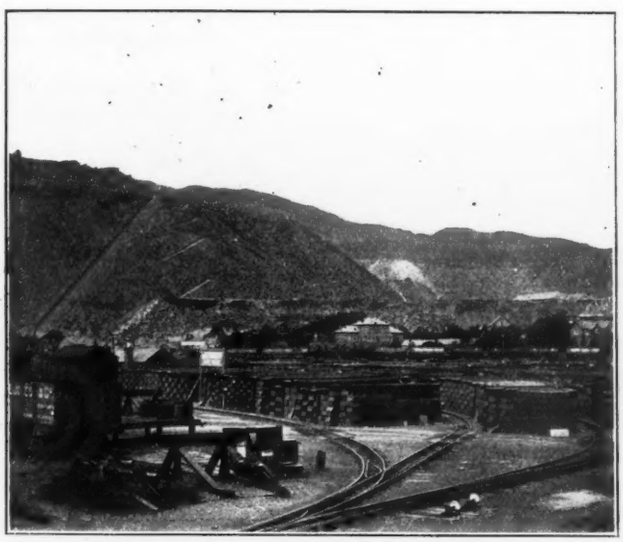
I have picked out the Oakeley mine for special description, because it is the most extensive slate mine in the world, as distinguished from a quarry. The management is large minded and up to date, and it is due to its efforts that the Festiniog companies have been drawn together, not into a combine, but into solidarity. The waste heaps of this mine form a conspicuous feature of the landscapes and are admired or otherwise by the tourists who come to see the beautiful Festiniog valley and the narrow-gage railway which runs down to Portmadoc, the slate



SLATE DRESSING SHEDS, OAKELEY MINE

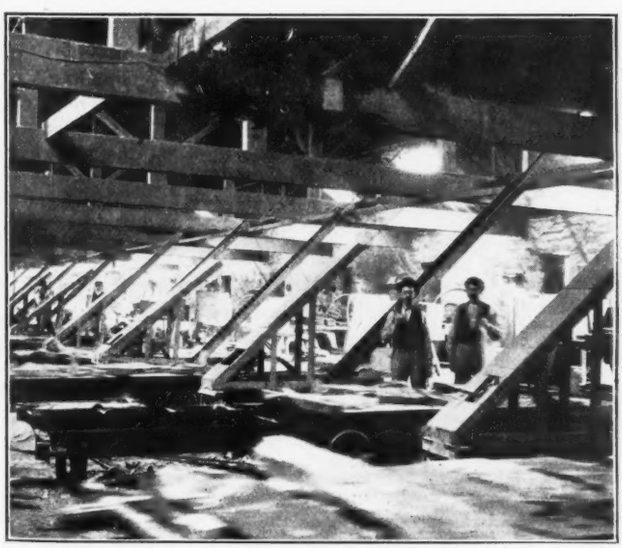


SAW FOR SLATE SLABS

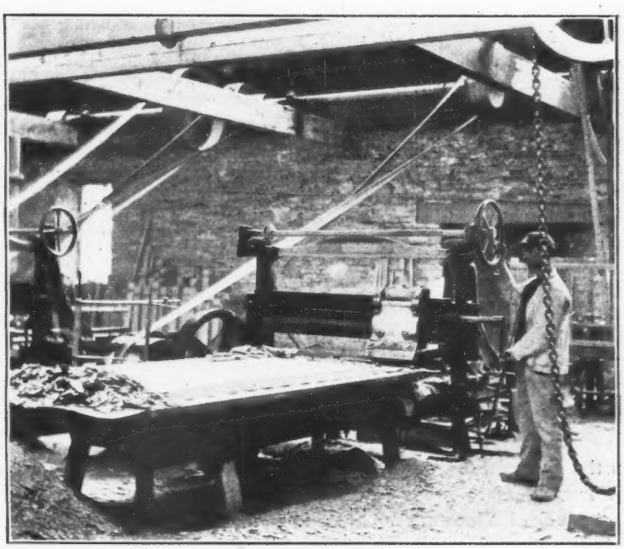


YARD AND DUMPS, OAKELEY MINE

OLD OPEN CUT, PARTLY CAVED, OAKELEY MINE



SLATE DRESSING SHED



PLANING SLATE SLABS

port on Cardigan bay. The hillside covered with waste slate is shown in one of the illustrations. To the left is one of the inclines up which the wagons are hoisted to the mine workings. In the foreground is shown the yard where stocks of slates are kept. The yard is situated in the town of Blaenau Festiniog and is about 900 ft. above sea level. The mine buildings and the dressing houses are at the top of the incline about 500 ft. higher. Another illustration gives a view looking down from the top into the open cut where work was originally commenced nearly a hundred years ago. There are still a number of old working floors visible, though a good deal of the ground has caved. The slate veins dip to the north at about 30 deg. from the horizontal and are now worked entirely in underground chambers. The method pursued is to work on a series of horizontal floors about 60 ft. apart. On each horizontal floor there are a number of chambers from 50 to 70 ft. wide separated by walls about 40 ft. wide left in the slate. The chambers from one floor to another are usually continuous. The various chambers and floors are connected by tunnels through the walls, and by means of adits and inclines with the outside. The extent of the working is very great. There are 26 floors altogether and the vertical depth between the top and bottom is 1430 ft. There are 40 miles of underground rails. There are five different veins, respectively 200 ft., 30 ft., 40 ft., 300 ft. and 30-150 ft. thick. They are all being worked. The mine is not now working at its full capacity. The normal output is 4000 tons of slates a month, but at the present time only a little more than 2000 tons are being won. The number of men employed is 1000 as compared with 1600 when the output is normal, and the mine is only working four days a week. Even with this reduction the output is greater than the demand, and the stock is accumulating at the Festiniog and Portmadoc wharves. In fact the stock of unsold slates is quite a year's output. Unfortunately there is no prospect of the trade's reviving and further curtailment of the output is more than probable. Men are leaving the district for the South Wales coal fields and for the United States, and even if a revival took place, it would now be difficult to obtain the necessary labor.

Power and Equipment

The plant for hauling and pumping is mostly modern and is of the electric type. Current is obtained from the generating station of the North Wales Power Company which uses the water power of a lake on the side of Snowdon. The lines bring the current eight miles over the hills at 10,000 volts. There are two transformer houses, one of which is shown in an accompanying illustration, where the current is brought down to 500 volts. The mine pays 7/8d. per unit and uses about 2000 h.p. The price is low enough, but as the current is three-phase I am inclined to believe that the mine is charged for far more power than it uses owing to the difficulty of measuring such current. Anyhow the mine officials in spite of the low price of the current are somewhat astonished at the power bill.

The mine has a good outfit of air compressors and rock drills of the Ingersoll-Sergeant type. The machine drills are used only for dealing with useless rock and for channeling purposes, the old jumper being still used for moving the blocks of slate.

The slate beds usually contain natural joints, and in judging how to break out the slate in the largest possible blocks it is necessary to take advantage of these joints. If there is no joint, one must be cut, or else the blast will blow the slate to pieces. For the purpose of making such substitutes for a natural joint, the compressed-air channeler is used.

The manufacture of slates and slabs follows the usual course. The pieces suitable for slabs are sent to the slab houses where they are sawn to shape and planed smooth. Saws and planers, and also the shape and size of the slabs cut, are shown in the accompanying illustrations. The pieces suitable for slates are sent to other sheds of which there are a great number. The method of cutting, splitting and trimming does not depart from the standard practice. Everything except the splitting is done by machinery driven by electric motors.

The Quicksilver Market in 1907

Prices for quicksilver improved in the last few months of 1907 owing to the California operators running short of stocks, and no exports being made. At the prices prevailing until the last few months it would not pay to export to China and Japan to meet the competition of the Rothschilds' quicksilver sent to those countries from Austria and Spain. The cost of mining is higher than formerly in California, so there is nothing in exporting to the Orient, especially as the production is now about equal to the domestic consumption. When this was not the case the producers here had to seek an outside market. As the Rothschilds make the price of quicksilver, when the California men were shipping to China and Japan, the price was kept down. When they stopped exporting, in September, the price went up.

At the Utah Copper Company's concentrating mill at Garfield, Utah, the coarser sizes of pulp are treated on vanners having corrugated belts, while the finer sizes go to vanners with smooth-surface belts.

The Commercial Situation in Mexico

The October panic in New York did not impart any sudden shock to Mexico, says a correspondent of the *Evening Post*. Its effect upon business in the United States, and some of the things which have followed upon it, have, however, made their influence felt in Mexico. This was, of course, conspicuously the case with regard to the great decline in the price of copper. No small part of Mexico's progress during the past five years has been due to its rapidly increasing production of copper. Numerous camps in northern Mexico were obliged to shut down operations in October and November, the most notable instance being Cananea. Even so powerful a corporation as the American Smelting and Refining Company found that market conditions dictated the closing of a number of mines which it operates separately, the closing at Velardeña, for example, throwing 1600 miners out of work.

More recently the fall in prices of lead and silver threatened even more seriously to affect the mining industry generally throughout Mexico. The copper camps are pretty well localized, and are mostly large single enterprises; but silver-lead ore is mined in nearly all the States of Mexico, by small as well as large concerns, usually operating in mountainous regions, distant from the railroad, and more commonly than not paying such freight charges that the margin of profit might easily be wiped out.

It is true that the labor cost has been lowered by the events of the last few months. Only last summer, mining and railway camps were bidding a *peso* and a *peso* and a half per day for workmen who would lay off when they chose, frequently averaging but half time. The desolation of Cananea, Velardeña, and other places has had its effect, and men are now available, in northern Mexico at least, for 75c. silver a day, and under the pinch of winter, after a year of short crops, with consequent high prices, are begging for work and willing to keep at it steadily.

The fall in the value of silver also promises to present a problem for speedy resolution by the Mexican Department of Finance. The next step, unless silver's price mends again very soon, will require that the Mexican Government should sustain the international ratio of two for one. This might be done by the Government selling foreign drafts, against its gold reserves in New York, London and Paris, at that ratio, or by putting the gold reserves at the disposal of the central banks for that purpose. But it would not be surprising if the outcome shall be a decision on the part of the Mexican Government to establish itself in actual fact upon the gold standard.

Devices for Saving Lubricating Oils

SPECIAL CORRESPONDENCE

During a recent visit to the Washoe smelting works I noticed several simple devices for recovering and regenerating lubricating oils. A storage cabinet which delivers the exact amount of oil desired without the intervention of measures and funnels can be adjusted to suit the capacity of oilers of all sizes and shapes. After the proper adjustment has been made a single stroke of the handle fills the oiler accurately and neatly. This measuring device with suitable modifications is also used for volatile oils. The oil is stored in suitable tanks buried in the ground at a distance which may be as much as half a mile. An automatic ball air vent is the usual method of sealing the filter supply tube used in filling the tank. Figs. 1 and 2 show the arrangements of this device which is manufactured by S. F. Bowser & Co., of Fort Wayne, Ind.

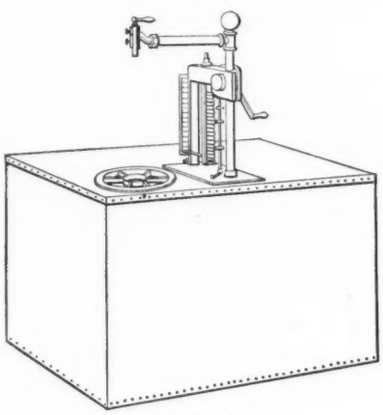


FIG. 1

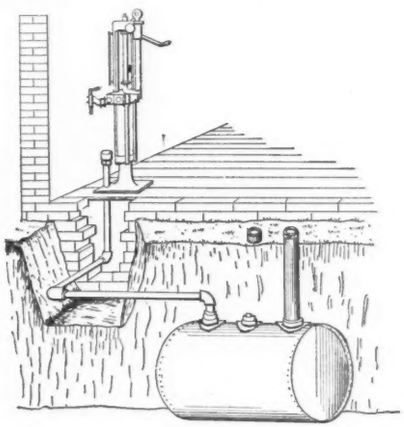


FIG. 2

RECLAIMING OIL AND WASTE

Another device effects the recovery of oil from greasy waste so that both the oil and the waste are again available for use. This apparatus is really a steam-driven centrifugal drier, modified so that steam, after causing rotation, exhausts into the interior basket containing the oily waste. In this compartment the steam liquefies the oil and grease, allowing it to be thrown outside the basket by the rotation. These separators have a capacity of 0.5 to 8 cu.ft. of lightly packed waste and require 20 lb. per sq.in. steam pressure and up according to the number of revolutions desired. It takes about 30 minutes to treat a charge. After treatment the waste needs only to be dried slightly and shaken up to be ready for use. So thoroughly is the grease removed that waste when taken from the machine does not soil the hands. The oil is cleaned and rendered fit for further use as a lubricant by filtration. These separators are made by the Oil and Waste Saving Machine Company, of Philadelphia.

FILTERING SYSTEMS

There are a number of machines supplied by different makers for filtering old oil. The chief objects of filtering are the removal of entrained water, metallic particles, dust and dirt. The systems are intermittent or continuously automatic in their operation according to the requirements of the plants which they serve. Two different systems of filtration appear to be in fairly general use. The first is the turbine system which is supplied by the Oil and Waste Saving Machine Company, and the second is a gravity filtering device made by the Liberty Manufacturing Company, of Pittsburg.

The turbine system appears to be of use only when the removal of entrained water is not an important consideration. The turbine consists of a drum revolving on a vertical axis. The dirty oil is fed to the interior of the drum through the turbine shaft while the latter is in operation. The revolving drum is lined with a filtering medium. A series of cones inside the turbine, similarly lined, gives an added filtering surface without increasing the space required by the apparatus. It is claimed in regard to this apparatus that when the filtering surface nearest the oil spray becomes clogged with dirt, the oil takes a new course through remaining clean portions, so that dirty oil is not required to be filtered through a medium which is constantly becoming more contaminated. The steam consumption per hour for driving the mechanism and heating the oil is equal to about 10 lb. of water. Capacities vary from 125 up to 1250 gal. of oil treated in 24 hours.

In the gravity system of filtration there are no moving parts, the oil moving along under the influence of gravitation. Three principles are made use of in reclaiming the oil, viz., separation, heat treatment and filtration. Fig. 3, a sectional view of the apparatus, shows how it works. The contaminated oil enters through 7 and discharges into a water-separating chamber *E* after having had the larger-sized foreign particles removed by the strainer *I* which is suspended in the cylinder *F*. In the chamber *E* the water settles to the bottom, and the oil, rising to the top, passes into the heating passage *A*, slowly traveling around until it enters the cleaning chamber *C*, flowing thence in the opposite direction from that followed in *A*. At the high temperature which the oil attains in *C*, most of the dirt settles out and does not reach the filter bags *D* so that these are less readily clogged. It is claimed that 10 per cent. of the reclaiming is done in *C*, so that the filter bags last 10 times as long as they would if required to remove all the impurities. The heating of the oil is done by exhaust steam. The filter bags last about four months before renewal becomes necessary, and the reclaiming units are made to serve 2000-h.p. plants. By combining units in multiple, any filtering capacity can be obtained.

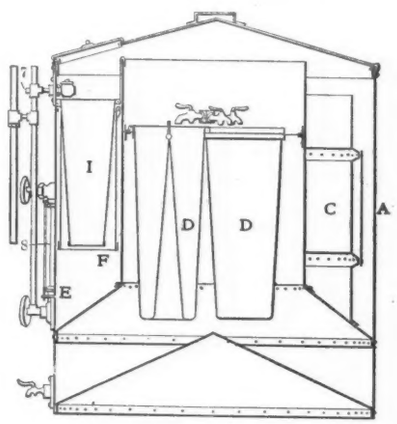


FIG. 3

According to the *Mines and Quarries Report for* 1906, there were 1190 separate fatal accidents in and about the mines and quarries of Great Britain, causing the loss of 1275 lives.

According to the London *Engineer*, observations have recently been made on the rate of cooling of the interior of a basic converter which may give some idea of the radiating losses during the bessemer blow. It was found that the temperature of the lining at the hottest visible point was as follows: On stopping the blast, 1550 deg. C.; one minute later, 1450 deg. C.; converter empty, 1350 deg. C.; five minutes after emptying, 1250 deg. C.; 10 minutes after emptying, 1200 deg. C.; 20 minutes after emptying, 1150 deg. C.; 35 minutes after emptying, 1100 deg. C. The observations would have been much more serviceable if the temperature of the outside shell had also been found, the temperature and velocity of the surrounding air, the approximate weight and constitution of the converter, so as to allow of calculating the actual heat units lost by the cooling.

Safety Devices for Mine Hoists

Report of the Transvaal Commission. Control of Speed in Hoisting and the Prevention of Overwinding. Signal Systems for Engineers

BY U. P. SWINBURNE AND ASSOCIATES

The first part of the report of the Transvaal Commission[1] on safety appliances in shafts related to safety catches for use in case of accident. The second and longer part[2] referred to the construction and proper use of hoisting ropes. The concluding portion refers to other safety devices.

Speed Control

To control the speed of hoisting and to secure smooth running, the use of a properly adjusted governor and a recording tachometer is recommended. The control of the steam throttle-valve should not be taken out of the engineer's hands by any automatic device, unless such device is so adjusted as to come into action only to prevent an overwind. The governor should act on the cut-off mechanism, and thus prevent over-speeding at any period of the hoisting. The recording tachometer will give a permanent record of all trips made and the speed at which the winding was done. While it only exerts a moral influence to prevent accidents, still, should an accident occur, it will prove of great service in supplying a reliable impersonal record of the speed of winding at the time, and the behavior of the engine.

Overwinding Prevention

With respect to the prevention of overwinding of the conveyance, the necessity for some device to effect this prevention will be apparent when one considers the number of accidents that occur, and also the loss of life and damage done to the hoisting plant, due to this cause.

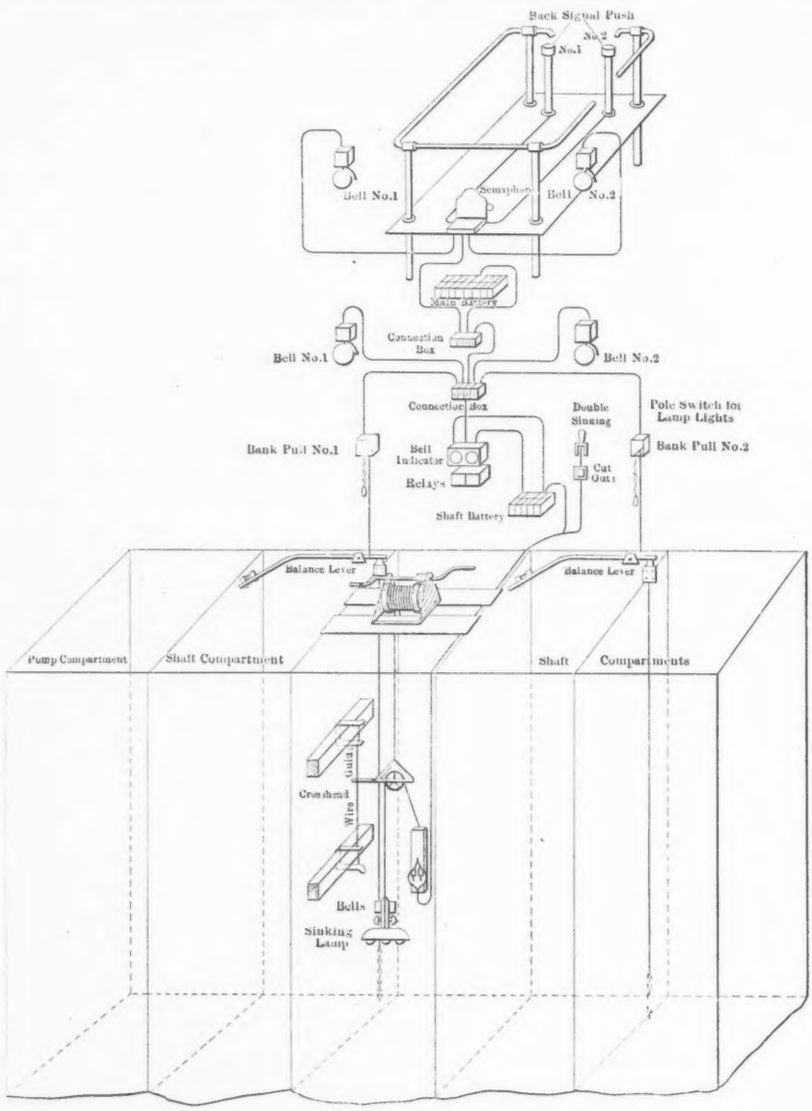
Since the beginning of the present year, 1907, there have been three cases in the Transvaal of overwind in which the detaching hook acted successfully. The suspending of the cage after the rope was freed was effected by safety catches, the wings of the hook not being required for this purpose. In two of these cases, persons were traveling and were saved from serious injury.

The Commission reports unhesitatingly in favor of detaching hooks for winding in vertical shafts, with the limitation that, where rests are used for loading in very deep shafts, the heavy hook is a possible source of danger, the length and weight of rope hanging in the shaft making it difficult for the engine-driver to control the amount of slack given out, thus leading to the chance of the hook bumping on the top of the cage. The detaching hook is not recommended for use in inclined or compound shafts where pulleys are used for the rope to run over, as there may be a danger of the hook, of whatever design, striking such pulleys and coming into premature action.

The Commission has not had the opportunity to test any of the speed safeties or other over-winding prevention devices, and is not in favor of making their use compulsory. This corresponds with the recommendation of the Dortmund Commission in Germany, in 1893. In that mining district there are many speed safeties of various patterns at work, but none of which were considered sufficiently reliable to definitely recommend.

Converging guides, buffer beams, safety keps or catch-beams are not made use of to any great extent in the headgears of the Transvaal mines, but their use is recommended, not compulsorily, in those comparatively few cases where the tipping arrangements of the skips will allow of their being fitted.

The present regulation which provides,



GOULD'S ELECTRIC LIGHT AND SIGNAL FOR VERTICAL SHAFTS

*From the report of the commission, appointed by the lieutenant-governor of the Transvaal, to inquire into and report upon the use of winding ropes, safety catches and appliances in mine shafts.

[1]This Journal, Nov. 2, 1907, p. 819.

[2]This Journal, Nov. 16, 1907, p. 929; Nov. 23, p. 971; Nov. 30, p. 1016; Dec. 28, p. 1203.

in cases where no automatic overwinding-prevention devices are installed, for a reduction in speed on nearing the surface, is doubtless of some service in preventing accidents, but there appears to be something more necessary.

In the Transvaal, in 2½ years, out of a total number of 67 overwinds, 56 were due to the engine-driver's neglect, and of this number, 13 were caused through the engine-driver having his reversing lever in the wrong direction. The majority of these drivers were certified, therefore no question arose as to their competency. Inspectors of mines have not hesitated to suspend the certificate in case of gross inattention or negligence, and it can only be hoped that a continuance of this practice will in time bring about the desired result. A contrivance attached to the reversing gear, to prevent the engine being started in the wrong direction, would be of service, but the Commission is not in a position to recommend the compulsory use of such device, as its reliability must first be thoroughly established by practical trials.

General Safety Measures

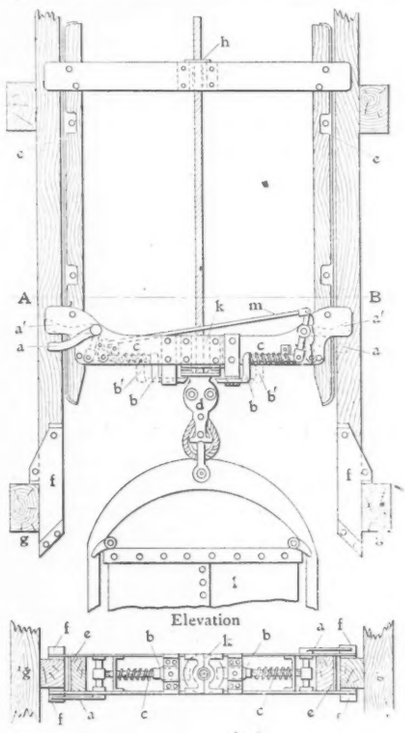
Representatives of the working engineers, who testified before the Commission, were in favor of extending the list of authorized signals; of isolating the winding engine from all other machinery; and of bringing into general use a bell signal recorder. They condemned barrel indicators as causing constant strain on engine-drivers' eyes, and were averse to the use of the chain drive for operating the depth indicator.

The Commission considers that it is inexpedient to further extend the list of authorized signals. Owing to the various kinds of mines and the different kinds of shafts, complete standardization in the matter of signaling is impossible. There appears, however, no objection to, and considerable reason for, universal signals in the cases of transport of explosives, notifying accident or emergency, and request for repetition of signals.

The isolation of the winding engine is a very necessary thing so as to keep the driver as free as possible from distracting influences, but there are practical difficulties in some cases, which prevent this custom being universally adopted. The Commission is, therefore, unable to recommend that this practice shall be established absolutely. The inspector of mines, at the present time, has the power to insist, where necessary, on isolation.

With regard to the use of a bell signal recorder, the Commission considers this very desirable, but, from the very limited experience with any such apparatus, it is considered premature to make this a compulsory attachment.

Concerning depth indicators, there can be no question that the dial and pillar types are in most general use and that they afford to the driver the clearest and most precise indication of the position of the vehicle in the shaft. A very necessary stipulation should, however, be made, that the travel of the pointer between the tip and the extreme bottom of the shaft should not make a complete revolution, within 3 in., on the circumference of the dial. The barrel indicator should always be so arranged that the pointer, while giving a fine reading in conjunction with the spiral grooves, also provides a rough indication in its own vertical guide. Regarding the chain-driven indicator, a good chain and sprocket gear is universally recognized as being a sound mechanical device, although requiring, perhaps, more attention in the way of adjustment than toothed gearing, and there is, therefore, no reason for prohibiting its use.



BERRY SAFETY CATCH FOR SWINGING BUCKET

Sinking with Buckets or Skips

A considerable amount of evidence was taken as to the relative advantages of the use of buckets or skips in the sinking of deep shafts, the Commission being anxious to obtain the best opinions as to the safest methods of deep-level sinking. From the evidence taken, it is not possible, at present, to advise upon any hard and fast regulations dealing with this matter; the question of whether buckets or skips are least dangerous depending largely upon the personal element in actual working and supervision, and upon details of ropes and winding plant. Until recently sinking with buckets has been the method most employed, and the number of recorded accidents show that a considerable amount of danger attends this method of sinking. The use of buckets has been rendered safer by the use of the Berry crosshead, and the Commission is of opinion that an approved crosshead is essential in this method of sinking.

The Transvaal Mining Regulations prohibit persons riding on the top or rim of a loaded bucket, and the Commission considers that this regulation should apply to empty buckets as well, in order to avoid an unevenly balanced load swinging in the shaft, and also to prevent any accidents due to the clothes or bodies of persons riding on the bucket rim catching on the shaft timbers. In addition to this the Commission considers it necessary that a loaded bucket should, when being raised to the surface stop when the crosshead is picked up, and that it should be rung away by signal from this point of stopping so as to insure a steady lift to the surface when the engine-driver puts on speed.

The use of sinking skips is, from a safety point of view, superior to that of buckets, but, while not giving so many opportunities for hoisting accidents, it can also be a source of considerable danger. The long runners on a sinking skip are a great disadvantage, there being a difficulty in giving a sufficient clearance between the long runner and the guide, and on occasions, serious shaft accidents have been caused by the skip sticking in the shaft when being lowered or raised on the long sinking runners.

In face of the recorded number of accidents with sinking buckets, deep sinking with skips is to be recommended as the safest method, inasmuch as a guided skip, not having the freedom of the sinking bucket, is effectively fixed in the shaft, is unable to swing, spin or strike the walls of the sinking compartment, and is not so much dependent upon careful hoisting, or the initial steadying of the load to be raised, as in the case of a sinking bucket in shafts that are not close timbered.

The Berry Crosshead

This device, which is shown in the accompanying sketch, is a mechanical contrivance fitted to crossheads of sinking buckets which insures attachment of crosshead to bucket as far as guides are continued down; but, at the point where they cease, bucket is disconnected by an automatic device. On being raised, the bucket again becomes connected positively with the crosshead.

Mine Signals

The accompanying illustration shows the Gould signal and lighting system, which is in use at the Geduld mine, and which is described in an annex to the report.

Electric light has been used usually by winding the leads to the lamp direct on to the barrel of a winch. In a few cases the winch has been left on the surface,

but, with depths exceeding 500 ft., the safety factor becomes very small, and the more usual method seems to be to have about 300 ft. of cable wound direct on a drum, necessitating the winch to be lowered every 200 ft. of shaft sunk; both these arrangements necessitate the electrical connections being broken and made every time the lamp is raised or lowered.

In this arrangement, the winch remains on the surface, and on it is wound a comparatively thin steel rope of 3/16 in. diameter, by which the crosshead is suspended. The sinking lamp, to which are also fixed the bells, is suspended by a four-core cable protected with a braiding of phosphor-bronze wire; the cable is led over the sheave of the crosshead, and is fastened at its other end by a clamp, suitably fixed to two dividers. The necessary connections are made here for the lights as well as for the bells; these connections are permanent as long as the clamp remains in this position. When the lamp is to be raised, the crosshead is pulled up by winding at the winch, naturally pulling the lamp up at double the speed. To prevent the crosshead turning or otherwise fouling, a guide-wire of about 180 ft. in length is provided.

The cable is about 330 ft. long, and as the clamp in the first instance is fixed about 80 ft. above the bottom of the shaft, it follows that the clamp and guide-wire must be shifted down about every 250—260 ft. of shaft sunk. The lowering of the whole arrangement is made very easy, and can be done in a few hours. The clamp is fixed with two U-shaped bolts to two of the dividers, and for removing and fixing the brackets for the guide-wire, one bolt need only be manipulated. After shifting the clamp and guide down, the permanent wire connecting on to the clamp need only be lengthened.

As the winch remains on the surface, the lamps remain at the bottom of the shaft till after the men have ascended from lighting the blasting fuse, and can be lowered again in advance of the men descending. The lamp is, therefore, always at the bottom when men are below, and it is for this reason, and because no disconnections are made, that it is adapted to carry bells, which not only permit of all signals given in the shaft being heard at the bottom, but provide back signals in the bottom of a shaft during sinking operations.

All signals in the shaft are given with the ordinary knocker line. At the top of each working compartment a balance lever is provided, the knocker line being attached to this lever by a clamp, which permits of the line being lowered conveniently as the shaft is deepened. The movement of the balance lever is transmitted to an ordinary electric bell-pull which causes a bell to ring on the bank and in the engine-room, at the same time acting upon a relay and the semaphore, and the relay rings the corresponding bell on the sinking lamp through an independent battery. The importance of this relay will be understood when it is mentioned that whatever may happen to the sinking lamp or bells thereon, nothing will interfere with the correct delivery of the signals to the surface. The semaphore is fitted with one white and one red disk, and is placed in front of the hauling-engine driver. It shows him (in addition to a different sound in the bells) from which compartment the last signal was given.

The Neill Process at Coconino Arizona

By E. P. Jennings*

This article is written in response to a request for information as to the result of this process at Coconino, the installation there and the general outline of the process having been described in previous articles by myself and others. Technical literature does not, however, contain a record of the later history.

The original method consisted in treating the ore, in a series of upright tanks 8 ft. in diameter and 18 ft. high, with sulphur dioxide. About five tons of ore was introduced into a tank half filled with water and the gas was forced, by means of a compressor, into this mixture of ore and water, the excess gas passing from the first tank to a similar one, also charged with ore and water, and thence to a third tank, where it was supposed the absorption would be complete. As a matter of fact we did not use half the gas which we generated, owing to the difficulty of absorbing sulphur dioxide gas when mixed with large volumes of air. When the ore in the lower tank was leached, an operation which usually took 10 hours' time, the solution and the leached ore together were dropped into a pressure tank and thence passed to a large filter press. The filter press was a constant source of trouble as it was impossible to find a material for the filters which would stand any length of time.

The solution from the filter press was heated by waste steam from the crushing plant and 60 per cent. of the copper was precipitated as cupro-cupric sulphite, the remaining 40 per cent. being precipitated by milk of lime, but as some iron went into the solution this, together with the copper and a certain amount of sulphate of lime, formed a precipitate which is best described by the word "nasty," and which contained only 7 per cent. of copper. Attempts were made to smelt a mixture of "red precipitate" and lime precipitate, in a reverberatory furnace, with poor success, owing to the inferior design of the furnace and the very poor quality of wood at our command.

Taken as a whole the Neill process at Coconino was a failure, its weak points being (1) the attempt to saturate the water by simply blowing the gas through it, (2) the poor agitation obtained and the consequent length of time required to leach a comparatively small amount of ore, (3) the dilute solution obtained (1 per cent. being the maximum amount of copper which can be held in solution by an excess of SO_2), (4) the ease with which the copper separates from these solutions, both in the leaching tank, the pressure tank and the filter tanks, forming what we call red precipitate throughout the mass of leached ore, and which it is impossible to re-dissolve with sulphurous acid, and (5) the difficulty of treating the remaining 40 per cent. of copper, which is in the form of copper sulphate, by any cheap precipitant obtainable in that remote country, scrap iron being entirely out of the question.

I have since experimented with this method somewhat modified, treating the ore in large revolving barrels, and found the copper to be much more easily dissolved than in the original Neill tank, and a plant might be devised consisting of a series of revolving barrels, through which the gas is passed and ending in a large coke tower to complete the absorption of the SO_2 which passes the tanks, using the water from this coke tower to charge the barrels. This method would obviate most of the difficulty, but I should not advise the use of the process where sulphuric acid could be obtained or made at a reasonable cost. Van Arsdale's method, described in the Journal of June 6, 1903, is worthy of attention. I have made experiments with it on a small scale, sufficient to satisfy myself that it can be made into a practicable copper-leaching method.

*Mining engineer, Salt Lake City, Utah.

Coal in the Transvaal

Consul John H. Snodgrass, of Pretoria, reports that at the close of 1906 there were 25 coal mines in the Transvaal, with an annual output of 3,712,339 tons, comprising: round coal, 2,139,639 tons: nut coal, 545,333 tons; fire coal, 66,164 tons; and the value of the output was $4,185,830, an average of nearly $1.12 per ton. During the year 527 white and 10,490 colored miners were employed, the wages of the latter averaging $10.44 per month. While 300 tons of coal per day are shipped to Delagoa bay for the use of shipping, no coal is imported into the Transvaal. Excluding the Lebombo range and the Limpopo valley possibilities, the amount of coal in the Transvaal is estimated at 3,000,000,000 tons, of which 80 per cent. is inferior, leaving 600,000,000 tons of high-quality coal.

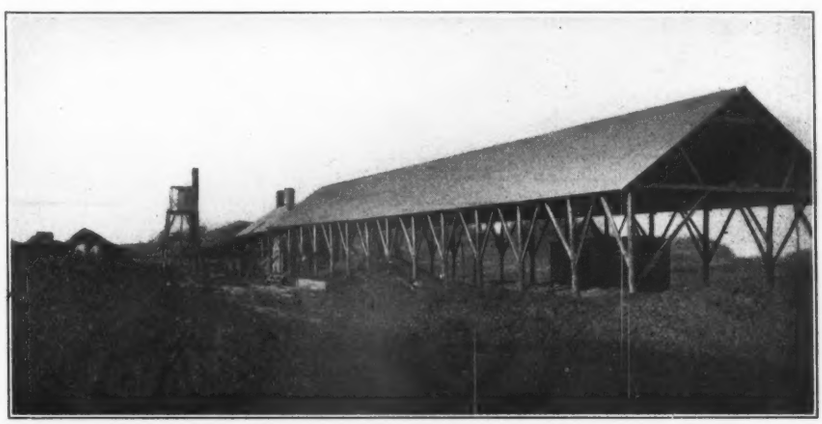
Phosphate Mining in Tennessee

By H. D. Ruhm*

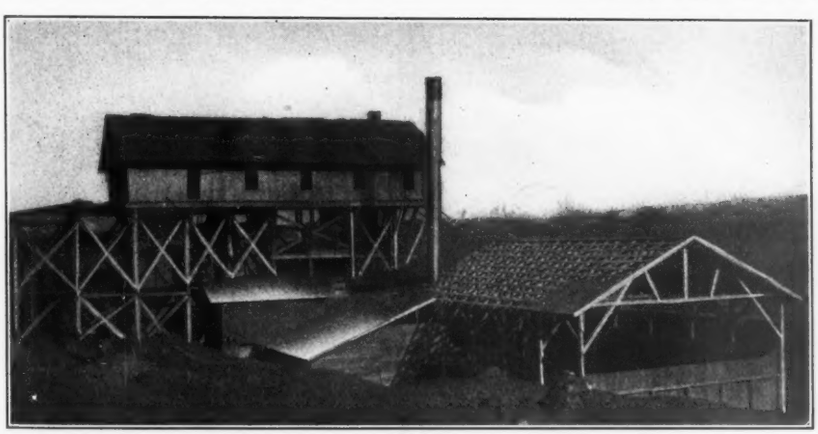
The year 1907 was a banner year in the phosphate field of Tennessee so far as development of new mines, installation of modern machinery at the old mines, and high price of rock are concerned. With all this, however, it is nevertheless a fact that the output of the field was notably less than in former years, and while exact figures are not obtainable, it is certain that the entire field did not produce more than 400,000 tons. Of this about 300,000 was shipped from the Mt. Pleasant field proper and the balance from the Centerville field, the Franklin field and the Pulaski field, with scattering shipments from many small stations along the main line of the Louisville & Nashville Railroad from Pulaski to Gallatin. Although it seemed positive that the high-water mark had been reached as to prices in November, 1906, when 75 per cent. rock sold at $5 per ton, the price climbed steadily to $6 during the winter and spring of 1907, and then instead of going down during the summer months as is usually the case, it went higher until $6.25, $6.50 and even as high as $6.75 were obtained for 75 per cent. domestic and as high as $8 for 78 per cent. for export.

Notwithstanding the high prices, labor was so greatly in demand all over the country, that it was impossible for the miners to supply the shipping requirements, until the acute car shortage put in its appearance in the latter part of August and early September. This caused considerable stock to accumulate, but kept prices well up to the mark until the financial catastrophe of November caused buyers to cancel contracts whenever possible and to stop shipment temporarily when they were unable to cancel.

During the last weeks of the year we were presented with the anomalous condition of an ample car supply, plenty of labor, fairly good weather and plenty of rock to ship, but very few places to ship it to. There was no diminution in price, except on the part of a few small miners selling at lower prices to those having contracts to ship on, and as most buyers stopped shipment on account of inability to get money to pay for rock and even to pay freight, it does not seem logical to expect any decrease in price. In fact as all the miners practically stopped digging rock, and confined their efforts exclusively to preparing and shipping out the rock already mined, thus rapidly depleting stocks on hand, instead of increasing them as would ordinarily be the case this time of the year, it seems probable that whenever financial conditions justify a resumption of business and rock is once more in demand, prices will ascend even above the present high-water mark.



DRYER, MIDDLE TENNESSEE PHOSPHATE COMPANY



WASHER AND DRYER NO. 2, BLUE GRASS PHOSPHATE COMPANY

Consolidation of Interests

In 1906 several predictions were made in these columns as to probable causes that might bring about drop in prices and I made use of the following language: "The independent factories are likely to get together and purchase their own supply of rock," and, "The demand may temporarily lull in the face of a greatly increased production; a temporary financial flurry may cause a decrease in the demand, etc."

The first of these predictions came true when 27 independent factories were brought together through the efforts of T. C. Meadows, of Buffalo, N. Y. The Independent Phosphate Company was organized and purchased from J. H. Carpenter and his associates, their brown-rock holdings at Solita, Estes Bend and Satterfield, and their blue-rock holdings at Leatherwood, paying $1,000,000, the price including the construction of railroad lines to Estes Bend and to Leatherwood. The company started operations at Solita and Satterfield at once, but was badly handicapped in many particulars, so that up to Sept. 1 only a small part of the requirements was produced, and the companies composing the combination had in many cases to pay some rather extravagant prices for rock. However, since Sept. 1, with a change of management and other changes, they produced nearly up to their requirements.

Mechanical Driers

This company adopted the policy pursued by the Federal Chemical Company for the past few years, and installed mechanical driers with coal as fuel, instead of the time-honored custom of burning rock on cord wood.

Following this lead several other new drying plants were constructed. At the end of the year the following were in operation, ready to operate, or in process of erection: Federal Chemical Company, four cylinders at Century, two cylinders at Mt. Pleasant; Independent Phosphate Company, two cylinders at Satterfield, two at Solita mines (Mt. Pleasant) and two under construction at Estes Bend; Mt. Pleasant Dryer Company, one cylinder; Richland Phosphate Company, one cylinder; Blue Grass Phosphate Company, four cylinders; Jackson Phosphate Company, two cylinders; Middle Tennessee Phosphate Company, one cylinder; and Charleston (S. C.) Mining Company, two cylinders, all at Mt. Pleasant, and the American Phosphate Company, one cylinder at Wales, near Pulaski.

Thus the year 1907 closed with 23 dry-

*Civil and mining engineer, Mt. Pleasant, Tenn.

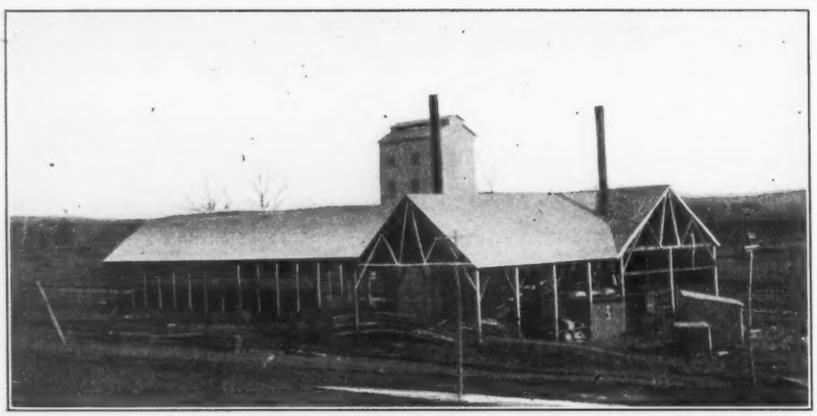
ing cylinders with an output capacity of 2300 tons per day of 24 hours. The year 1906 closed with only four such cylinders in operation.

The second prediction seems likely to be fulfilled if all these plants are kept working, and the third is a mournful reality.

The Outlook

The only possible salvation of the situation as to present prices, is in the present policy of curtailing production, and unless the miners get together and consolidate in some way, their shrift is short for the maintenance of recent prosperity. When they have the example so thoroughly before them of the ability to get together, on the part of competitive buyers of their production, it seems lamentable that some of the captains of the phosphate industry are not able to control the situation to the extent of consolidating the mines not already under the domination of some of the fertilizer controls, so as at least to be able to cut down production to a sufficient extent to allow the fertilizer manufacturers to use up their own deposits while possible low prices prevail.

If this is done the business will maintain a normal level at least. If it is not and holders of rock become panicky to sell, that dreaded backward swing of the pendulum may carry us back to the conditions of 1900 once more.



DRYER, JACKSON PHOSPHATE COMPANY

The Verespatak-Abrudbanya District, Hungary

By Gustav Slujka

In the Transylvania gold region the Verespatak-Abrudbanya gold country forms a separate territory with special statutes and regulations. In olden times, owing to the fact that the district is traversed by innumerable gold veins and stockworks, the regulations fixed the single claim (Feldmass) very small, 10 Vienna *klafter* (18.964 m., or 20.739 yd.) wide, 20 *klafter* (37.928 m., or 41,478 yd.) long and 20 *klafter* (37.928 m., or 41.478 yd.) deep.

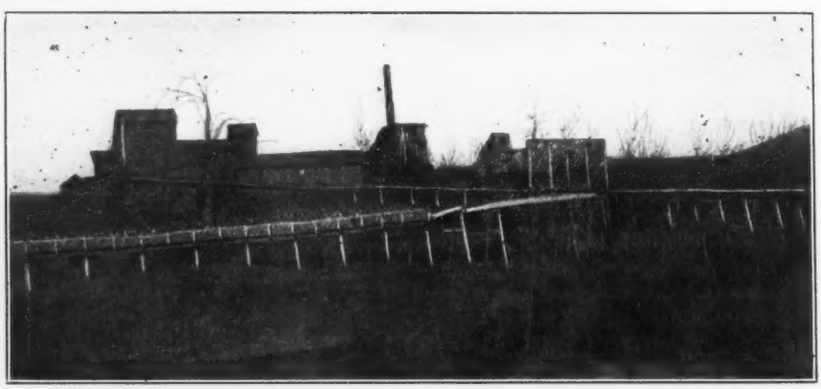
There are mining companies which own only from 10 to 15 such claims; richer companies own from 100 to 540 of these claims, but even this is a very small block of ground for systematic mining operations. The small claims were good 100 or 200 years ago, when the mines were rich and labor cheap, but at present the only remedy is to merge the small companies into one large company, which would work the mines with more economy. The Verespatak gold mines are far from being worked out, but in general the system of working must be modernized.

Previous to 1867 there were circular claims, known as *bal* claims, 40 Vienna *klafter* (75.859 m., or 82.956 yd.) in diameter. The circular is an impractical shape for a claim, because where three of such claims touched each other, a plot is left which is "nobody's territory" called in Verespatak *inclave*. These presented opportunities not overlooked by the mine sharks, and *holongers* or mine thieves; in case of prosperity they annoyed their neighbors by limiting their operation, under the pretence that they are out of their legal territory. This sort of quarrel always involved a survey by the mine commissioner.

Old Roman workings are often found in the Transylvania gold region. As no traces of pumping implements are found it still remains a puzzle how these were unwatered. About 15 years ago, Roman workings were found in the Tipele on Orta mountain at the end of an adit about 800 yd. long and at a depth of about 40 or 50 yd. from the surface. Fire damp in small quantity was found there, originating probably from the decomposition of mine timbering, but no pumping implements could be discovered. Some interesting ancient carvings were found at the end of an old abandoned adit.

Poor Outlook for Chilean Copper Mines

Consul Alfred A. Winslow, of Valparaiso, reports that the Government official report shows there have been 7854 copper claims worked in Chile at different times, of which only 748 were worked in 1907. Many of these mines are rich in copper, but with the high price of labor and the poor transportation facilities, few, if any, can be made to pay at the present low price of copper, save those equipped with up-to-date machinery. These are limited, and should the present conditions continue, the production of copper in Chile for 1908, it is estimated, will not be one-half that for 1907. The future for the mining interests does not seem bright at present. The scarcity and high price of labor are factors that bear heavily on this industry in Chile.



CHARLESTON MINING COMPANY WASHER AND DRYER, ARROW MINES

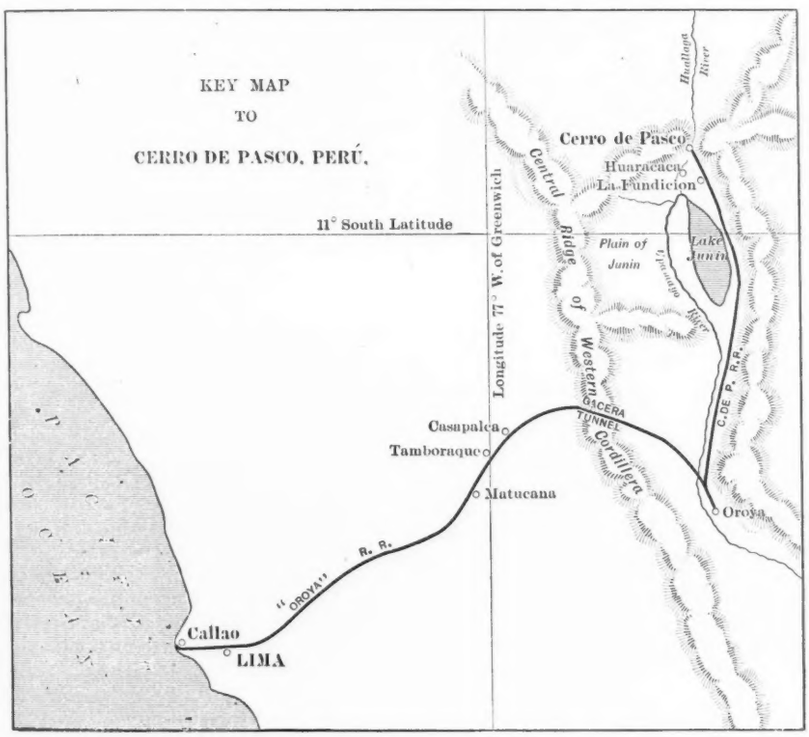
When a steam shovel is used in handling large boulders and friable sandstone which will not pass through the dipper, chains are used. These chains should have a hook at each end, one hook to fasten the rock and the other to hook into a chain attached to the dipper arm. Two ½- to 1-cu.yd. boulders can be chained out at one time by this method. For 1- to 3-cu.yd. boulders a chain with a pair of grab hooks should be used and a man employed to drill dog holes in the rock for the hooks to bite into. A 65-ton shovel is capable of loading a 4-cu.yd. rock or boulder.

The Cerro de Pasco Mining District, Peru

An Ancient Silver Camp Situated at an Altitude of 14,000 Feet, Now the Scene of Extensive Copper Mining and Smelting

BY CLARENCE C. SAMPLE*

A trip to the high altitudes of the Andean plateaus should be contemplated with due consideration as to the constitution and health of the individual. Perfect freedom from heart, pulmonary or circulatory weakness is essential to a prolonged stay in the rarefied atmosphere. Before deciding upon such a trip it is advisable to consult a physician, and if any weakness of heart or lungs is found the trip should not be attempted. Many who have been pronounced perfectly healthy by competent physicians, often develop alarming symptoms upon their arrival in high altitudes.



For the greater part of the journey, from New York to Cerro de Pasco, one is on the ocean where the temperature is most agreeable and clothing of moderate lightness is comfortable; but crossing the Isthmus of Panama, the heat is, to one not accustomed to the tropics, most intense and exhausting. In Lima and the coast towns of Peru, the same clothing may be worn the year round. A light overcoat will be needed evenings. Nothing but "roughing" clothes will be needed in the mountains. They should be warm. A heavy sweater or a corduroy jacket with a heavy wool lining is better than an overcoat. If much riding is to be done it is advisable to take one's own saddle and bridle with capacious saddle bags. For protection from rain, a rubber-lined khaki suit is preferable to either poncho or mackintosh. It is always best to have one's own blankets, sheets and towels, for in respect to these things the mountain hotels are not fastidious.

In traveling about the country the itinerary can usually be arranged so as to permit one to pass the night in some town where sleeping quarters may be had. Food is scarce in the smaller towns; it is advisable to take a plentiful supply of provisions on a journey. Blankets, food and other supplies are obtainable in the coast towns but not often in the interior. Ordinary trunks may be taken to all points on the railroads, but to other points, everything must be carried on the backs of mules or llamas. The mules can take loads of 200 lb. such as two small steamer trunks might weigh, but mules are not always easy to obtain and llamas have to be used in their stead. Transportation by llamas is far from satisfactory, they carry scarcely 100 lb. and travel with great slowness and irregularity, but find sustenance where a mule would starve. Water-proof canvas bags about the size of mail pouches are the most convenient means of carrying luggage, as their contents may be so arranged that two bags exactly balance.

Routes of Travel and Costs

There are three lines of passenger steamers running from New York to Colon: the Royal Mail, sailing fortnightly; the Hamburg-American (Atlas Service), with one steamer a week; and the Panama Railroad Company's steamers, sailing twice a week. The trip of 2000 miles is made in six days. The fare charged varies from $55 to $90. From Colon to Panama is 48 miles. The trip is made in three hours over the Panama Railroad, there being several trains daily in each direction. The fare is $2.40. Colon is usually cooler than Panama but it is best to wait for a steamer at the latter port for the hotels are much better there; there are several of them, both native and American, charging from $4 to $5 per day for room and board.

There are two lines of steamers which sail from Panama along the west coast of South America they are the Pacific Steam Navigation Company, an English line, and the Compañia Sud-Americana de Vapores, a Chilean company. There is little choice between the steamers of the two lines. Neither adheres strictly to a sailing schedule, but a steamer of one line or the other sails about every week or ten days. The steamers are vessels of 2000 to 3500 tons displacement; the staterooms are large, clean and airy, opening directly upon a promenade deck. The food is excellent and the service efficient and clean. The trip of 1660 miles from Panama to Callao is made in 10 days, including stops in Guayaquil and the ports of northern Peru. The fare is £21 or about $105.

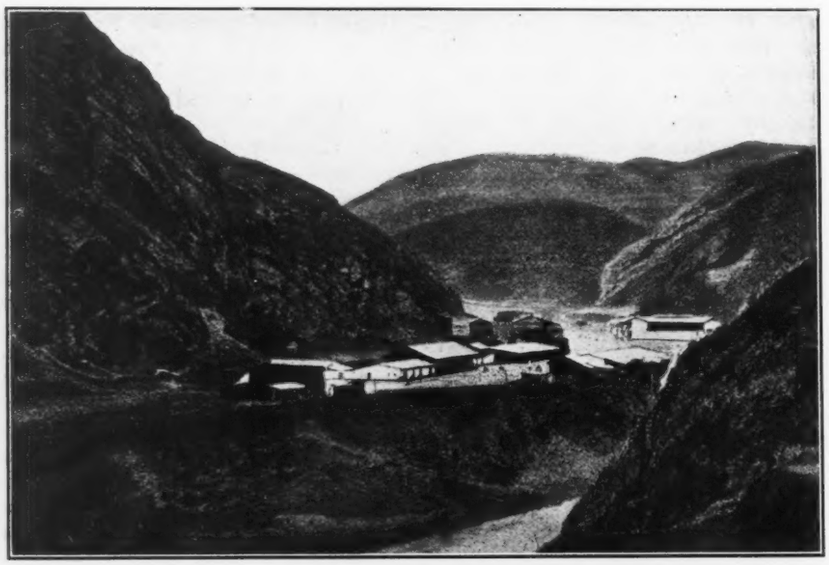
Quarantine and Customs Regulations

Upon arriving in Callao the steamer is put in quarantine until five days have elapsed since leaving Guayaquil. The steamer is then disinfected by the sanitary squad. The passengers are taken ashore in boats. At the wharf the baggage is opened and inspected by the customs inspectors, who are polite and do their work with as little annoyance to the passenger as possible. Such articles as tobacco, opium, silks and silver must pay an import duty. After the customs in-

*Mining engineer, Bluefields, Nicaragua.

spection the baggage and keys are turned over to the sanitary officers, who send all baggage to be disinfected. The passenger is not allowed to take any baggage whatever into the country without being disinfected, and moreover, no baggage can be sent from Lima or Callao into the interior without a repetition of the process. These precautions are taken to minimize the ravages of the bubonic plague, and must be gone through with again, upon leaving the country.

Callao is the principal seaport and upon the whole is a clean little city of 15,000 inhabitants. It lies seven miles from Lima, the capital, with which it is connected by both steam and trolley lines which make the trip in 20 minutes. Lima is a city of 200,000 inhabitants, where a large proportion of the real estate is owned by foreigners. There are several good hotels charging from $4 to $5 per day for room and board. The city is well worth a stop of several days. Originally laid out by the founder Pizarro, in 1535, the older streets are narrow but straight and intersect the cross streets at right angles. The new streets are broad, well paved and some of the boulevards are beautiful. The museum, public buildings and the Exposition grounds are particularly interesting.



LA OROYA, 13,400 FEET

The Trip over the Oroya Railroad

Cerro de Pasco, the chief copper-producing district, is reached from Lima by the Peruvian Central, and Cerro de Pasco railroads, the former being more widely known as the Oroya road. A portion of the road was operated as early as 1871. The total length of the line is 136½ miles and the road is claimed to have cost more than $100,000,000. The Oroya road is perhaps the most wonderful feat of railroad engineering ever attempted. The trains are lifted 15,665 ft. in a total ascent of 88 miles without a downgrade and without resorting to cogs, endless cables, rope, or rack. The maximum grade is 4 per cent. cent.

There are two trains each way a week. They leave Lima every Tuesday and Friday morning at seven o'clock. The train is made up of two passenger coaches, and a baggage car, drawn by a small Baldwin locomotive burning crude oil from the wells of Piura in northern Peru. The road follows the valley of the river Rimac for the greater part of its length. The first two hours of the run are through gently rising foot hills, in which thrives a luxuriant tropical growth. After the ascent of the cordillera is begun, no more vegetation is seen. The mountains tower to lofty hights, with sides so steep that they retain no soil. Great dikes of dark colored rock stand out in strong relief against the background of lighter rock through which they pass; up the sides of the mountains and across the tops these dikes can be seen stretching for miles.

At Tamboraque 8000 ft. above the sea, is found the first metallurgical establishment, a small smelter, which at the time of my visit was just being completed. Farther along the line at Casapalca, 10,000 ft. above the sea, is the extensive plant of the Backus & Johnson Company, one of the first modern, and until recently the largest smelter in the country. Here are treated the ores from Backus & Johnson's mines, and also custom ores from the neighborhood.

From Casapalca the ascent becomes steeper, the air grows chilly and mountains come in sight whose tops are perpetually covered with snow, while here and there in crevices, hidden from the rays of the sun, are small pools whose surfaces are covered with ice. At two in the afternoon the summit is reached and the train passes through the Galera tunnel, more than 3000 ft. long and 15,665 ft. above the level of the sea. From here the road slowly descends to an altitude of 12,465 ft. at Oroya. Oroya is reached at 5.30 in the afternoon; there is an excellent hotel wherein to pass the night. A short line of railroad runs from Oroya to Huari, and over it are brought the ores from Morococha and other mines in the district of Yauli. At eight o'clock the following morning a train leaves for Cerro de Pasco, 90 miles distant. The Cerro de Pasco Railroad was commenced by an English syndicate, but the work was not carried far. The American company which now owns a large number of mines in Cerro, bought the uncompleted line and has since carried the road to completion. The cost of the road is said to have been in the neighborhood of $6,-

CERRO DE PASCO

000,000. From Oroya through a cañon 15 miles long was the most difficult section to build. The course of some of the mountain streams had to be changed, and one double switchback constructed. By this means the plain of Junin was reached with an almost level track across it to the outskirts of Cerro de Pasco. Some further engineering manœuvers were necessary to bring the terminus of the road into the foot hills 2000 ft. above the plain. The road is standard gage and the locomotives are large and powerful and of modern design. Bituminous coal is burned, brought from the company's mines near Cerro, or from Newcastle, Australia. The train arrives at Cerro de Pasco at two in the afternoon.

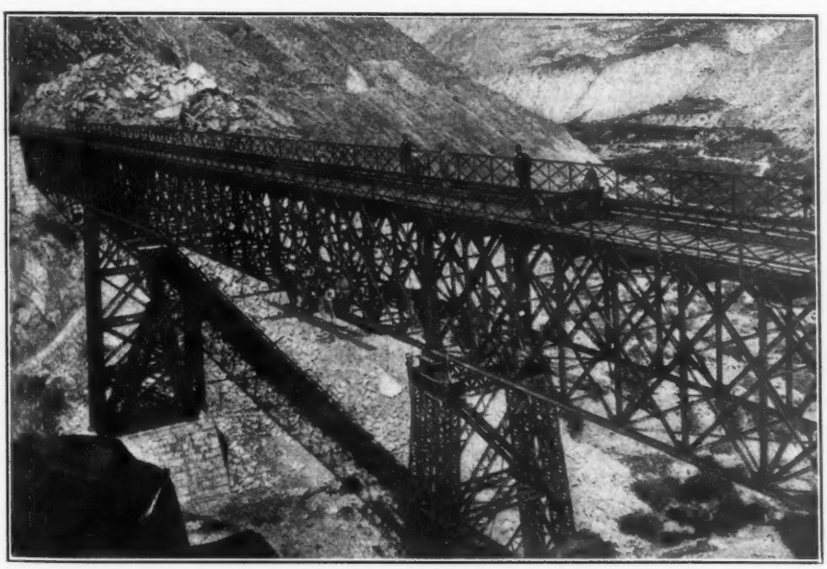
Effects of the Altitude

It is a wise plan to make this trip in gentle stages. The change from sea level to the altitude of Cerro de Pasco is one that all constitutions cannot, or at least, should not be made to endure. It is much better to wait over one train at Tamboraque, Matucana or Casapalca, where are found good hotel accommodations, and become gradually accustomed to the change. I made the trip in two days and my experiences may be of interest. Leaving Lima the pulse was counted at the rate of 77 per minute; this gradually increased to 90 at the time of passing through the "Galera" tunnel, the highest point on the road. Here I felt no discomfort whatever and walked about a few minutes while the train was taking water. From there on to Oroya I became very drowsy and slept most of the remainder of the trip. Upon leaving the train I was so dizzy as hardly to be able to walk, and staggered to the hotel as if intoxicated. The pain in the chest was almost beyond endurance, accompanied by violent throbbing in the temples and a raging headache. I shall never forget that night in the Oroya hotel where four of us were put into one room. It was intensely cold. Not that the thermometer sinks so low, but the cold in the high altitudes is peculiarly penetrating. It was impossible to sleep and the sensation in the chest was as if one were being stretched on a rack. It is not uncommon to develop an increase of three or four inches in chest expansion in two weeks' time, but it is exceedingly painful. At that time we would have given most anything for the privilege of not breathing for five minutes.

The next morning we all felt better although the pulse rate had increased to 110 and 120. Upon arriving at Cerro we all went to bed and there remained for three days.

Some fortunate people experience no discomfort whatever upon arriving in the high altitudes, nothing but an increase in the pulse rate. Others recover in three or four days, while in one case of which I know it was six weeks before the individual could walk a hundred yards. The normal pulse of a healthy person never falls below 90 in this region. The pains in the head, chest and temples, called *siroche,* disappear after 10 days, but few are ever able to walk rapidly, make a sudden exertion, nor bend the head over below the waist line without experiencing a giddy sensation. One Christmas day some of us attempted to play a game of base ball but no one to my recollection ever reached first base.

CHAUPICHACA PASS, 15,000 FEET



CHALLAPE VIADUCT, OROYA

Topography of the Andean Cordilleras

There are two chains, or as they are called, cordilleras, distinguished in the mountain system of the Andes. The western cordillera runs parallel with the shore line and rises as a wall above the western side of the inter-cordilleran plateaus. These mountains attain elevations of 15,000 to 18,000 ft. above sea level. The prevailing winds are from the east and all the moisture is condensed so as to fall upon the eastern side of the western cordillera. As a consequence the narrow strip of coastal land, varying in width from 20 to 50 miles on the western side of the cordillera is sterile, being for the most part a sandy desert but capable of producing abundant crops when irrigated.

Farther inland is the eastern cordillera which taken as a whole has a general trend nearly parallel with the western but consists of many ranges of broken mountains of less elevation than the other system. Individually these eastern ranges vary much in direction, sometimes running nearly east and west. In places

they project far eastward into the Amazon region and in others unite with the western chains making what are called *nudos,* or knots. Between the two cordilleras lie plateaus or table lands, whose altitude varies from 13,000 to 14,000 ft. The surface of these table lands is uneven and traversed by ranges of hills which surround large lakes or rolling prairie land. The general slope of the plateaus is to the north and east so that the drainage is into the Amazon.

In the Department of Junin is one of these great plateaus, encircled by the mountains of both the western and eastern cordilleras, which coming together form one of the knots known as the Nudo de Pasco. This plateau extends north and south a distance of 120 miles and contains the large lake of Junin, the Pampa of Bombon, the Basin of the Cerro and the town of Cerro de Pasco, the capital of the Department. Lake Junin has an area of 200 square miles and an elevation of 13,380 ft. above the level of the sea. It is drained by the river Upamayo which flows northward from the lake, then turning about in a great circle flows in exactly the opposite direction, receiving the waters of the San Juan and Colorado rivers, then continuing its southerly course unites with the river Huamanca near Oroya, and passes through the southern depression of the plateau on its way to the Amazon. The Huallaga river rising near the town of Cerro de Pasco flows through the town, then taking a northeasterly direction passes through a break in the mountains, eventually joining the Amazon.

Location and Climate

The town of Cerro de Pasco is built upon a ridge which is entirely surrounded by hills, rising like an amphitheater to altitudes of several hundred feet above the town. This central ridge is about 1½ miles long from north to south and ¾ mile wide. The altitude at the railroad station is 14,072 ft. and at the top of Santa Catalina hill 14,285 ft. The popu lation is between 10,000 and 12,000.

The houses are built of stone and adobe, some of them being two stories high and fairly comfortable. They are roofed with corrugated iron, tiles or thatch. The houses of the poorer classes are one-story, one-room, wretched affairs, often having no window. The houses are built one alongside of the other in no regular manner, and the streets take a tortuous course between the houses. Some of the streets are paved with stone, others are not paved at all. There are several churches, an assay office, and a hospital. The most pretentious building in the place is the Esperanza, or office building of the Cerro de Pasco Mining Company.

The mines are directly under the town and often the entrance to them is from the streets or in the yards back of the houses. Walking about the crooked streets after dark is somewhat hazardous; a sudden turn may bring one dangerously near the edge of some abandoned or caving shaft. In the back yard of one of the saloons, of which there are a great number, I saw a modern steel head frame; at another place the shaft was on one side of the street and the winding machinery directly across; drivers of passing carts had to duck their heads to avoid contact with the hoisting rope.

The climate of Cerro de Pasco leaves much to be desired. Rains are prevalent as a rule from November to March, the greatest fall being in the first three months of the year. The rainy season is warmer than the dry, but fires are needed throughout the year. From March to November rains are not so common but hail and snow storms occur frequently. In the rainy season one usually rises to find the ground covered with frost or two or three inches of snow, with the sun rising into a cloudless sky; little or no wind is blowing nor is the thermometer very low. The temperature seldom falls below 10 deg. F. even on the coldest nights. At nine in the morning the heat of the sun commences to melt the snow which usually has entirely disappeared at ten. At eleven it is warm in the sun, but upon going into the shade or if the sun is hidden for a moment by a passing cloud, the air feels chilly. At noon a strong wind begins to blow followed quickly by an overcast sky. Later a violent hailstorm comes up, followed immediately by a heavy thunder shower with an almost unceasing lightning display. The thunder storm usually lasts an hour after which it settles down to rain steadily. Later in the afternoon the sky may clear for a time, but will become overcast again at five, and as the sun sets very likely it will be snowing again. Later in the evening one may possibly see a perfectly clear starlit sky. A great number of fatalities occur from lightning stroke both among the people and in the herds of llamas.

The entire aspect of the region about Cerro de Pasco is dispiriting. The trails are rough, the hills stand out bare and abrupt on all sides. The pampas, rolling plains covered with short green grass and a variety of star-leafed moss growing close to the ground, are perfect pictures of desolation. No trees nor plants of any kind are to be seen, barley can be grown but it does not ripen; for other vegetables and grains the climate is too cold or the altitude too great. The pampas abound in treacherous bogs in which both men and animals lose their lives. Here and there are solitary huts of the Indians, built of sod and roofed with thatch, with a low stone-walled corral at the side for sheep or llamas.

To some the climate of Cerro is exhilarating; there are many foreigners who have spent the greater part of their lives in the region. Intemperance and careless living are accountable for many complaints, but with the exception of colds, which are common, there is little sickness or disease.

One may, in a few hours, ride down into some valley where the climate is always agreeable and where crops of every description are grown the year round; and in one day's ride the Amazonian slopes of the eastern cordilleras may be reached where the climate is tropical.

Use of Mica in France

Consul-General Robert P. Skinner reports on the imports of mica into Marseille, presenting the following details: In 1906 the imports amounted to 18,974 lb., of which 8382 came from India, 7255 from England, 3086 from Egypt, and 251 from Madagascar. While the trade is considerable at Marseille, the actual transactions are arranged commercially in Paris. One of the principal concerns in this trade supplies the following facts:

"The prices of mica are likely to vary from 50 centimes to 40 francs (10c. to $7.72), or even more, per kg.. Mica powder is utilized principally in the wall-paper trade. The chief uses of mica in the piece are in the heating and electrical industries. For heating purposes very clear mica is required, one without blemish, and we look mainly to importations from Madras for this class of micas. For electrical purposes the qualities required vary materially, but must not permit of the creation of short circuits; for this reason all micas carrying metallic traces have to be rigorously rejected.

World's Output of Iron Ore

Consul-General Robert J. Wynne, of London, reports that the preliminary figures so far available to the British Board of Trade are contained in a return issued the latter part of November. It is estimated that the world's output of iron ore in 1906 was about 125,000,000 tons, the principal producers being the United States, Germany, the United Kingdom, and Spain, in the order given, these countries accounting for about 78 per cent. of the total output. The figures show that in the United States there was an output of 7,000,000 tons more than in 1905, the total being rather under 50,000,000 tons. In Germany there was an increase of over 3,000,000 tons, and in the United Kingdom and Spain of 1,000,000 tons each.

Geological reports issued by the Southern Pacific railroad show that there are seven districts in California where workable deposits of iron ore exist, in a region where only 6000 square miles of territory has as yet been explored.

Some Bullfrog Mines

By W. H. Spaulding*

The Montgomery-Shoshone Consolidated Mining Company which controls the Shoshone Mines Company, the Polaris Mining Company and the Crystal Bullfrog Mining Company, comprising 12 claims all contiguous to the Montgomery-Shoshone Mines Company, is situated one-half mile east of Rhyolite. The first location on the latter property, and one of the first to be made in the district, was that of E. A. Montgomery, about three years ago. The outcrop was strong and well defined, and could be traced easily on the surface for 3000 ft., the first discovery being made close to the site of the present workings. This property, the Shoshone mines, has been developed by a three-compartment vertical shaft, to a depth of 570 ft., levels being cut at 100-ft. intervals. Sinking is still in progress. Water was first encountered at 45 ft. below the fifth level, and about 30,000 gal. are pumped to the surface daily at the present time.

Regarding the character of the bodies developed, the extensive dumps of ore on the surface are the result of development work only, no stoping as yet having been begun. Besides the ore on the dumps and that going directly from the mines to the mill, 40 tons are daily shipped to the smelters at Salt Lake City. The property is equipped with two 120-h.p. water-tube boilers using crude oil for fuel and furnishing power for a 12x16-in. double-drum, geared, hoisting engine. A Franklin compressor furnishes air for pumps and machine drills; it is driven by a 100-h.p. electric motor. Electric power is supplied to the workings, the mill, etc., by the Nevada-California Electric Power Company, of Bishop Creek, Cal.

The Shoshone-Polaris has been developed to a depth of 300 ft., showing a good grade of milling ore at this level with some shipping ore. The workings have been connected with the shaft of the Montgomery-Shoshone from which all the hoisting is done.

Bullfrog Reduction Mill

The Bullfrog Reduction and Water Company has erected a mill on the ground and will treat the ores of both companies. Water for the mill is supplied by a 6-in. pipe line from Goss springs, nine miles distant, to a pumping station, whence the water is pumped to the mill by a 5x12-in. Aldrich quintuplex pump, a distance of one mile against a head of 500 feet.

The ores from the mines are dumped directly into the 200-ton bin at the head of the mill, and from this bin are fed to the 15x24-in. Blake crusher, passing to an elevator, fitted with 14x8-in. buckets, which elevates the ore to two Vezin samplers; these cut out the desired sample and permit the remainder of the ore to pass directly to the fine-ore bin of 200 tons capacity.

From this bin the ore is fed to a 14x42-in. roll by means of a plunger feeder, and from the rolls it is delivered by an elevator to a revolving screen, fitted with a ⅝-in. round-punched screen. The oversize returns to the roll, the undersize passing to a second screen which delivers a finished product of 16 mesh, the oversize going to 14x42-in. rolls and is delivered by elevator to two revolving screens fitted with 8-mesh, No. 16 wire-screen cloth. The oversize from this screen goes directly back to the rolls, the undersize passing to two Traylor centripact screens delivering a 16-mesh finished product, the oversize going to the finishing roll and thence to two Traylor centripact screens fitted with 16-mesh screen cloth, the oversize returning to the finishing rolls until all material passes these screens.

The 16-mesh finished product is passed over ten silver-plated copper plates, 56x120-in., for catching the free gold by amalgamation. From the plates the pulp passes to two Dorr classifiers making a separation of the sands from the slimes. The sands are treated on seven No. 5 Wilfley tables, the slimes being treated on ten 6-ft. Frue vanners.

Cyanide Treatment

Separate treatment for the sands and slimes is necessary in the cyaniding operation, in which about 3 lb. cyanide, 8 lb. lime and 1½ lb. of zinc per ton will be consumed. The sands flow from the Wilfley tables to a Blaisdell wet-pulp distributor which distributes the product in two collecting tanks, 36 ft. in diameter and 6 ft. 6 in. deep. These tanks are equipped with openings in the sides, permitting an even overflow of the excess water contained in the sands. This overflow carries with it a small amount of sand and slimes, which are again separated in a small hopper-bottomed tank, the sands passing from the bottom and the slimes overflowing from the top. These sands are pumped back to the collecting tank by means of a 2½-in. centrifugal pump.

The slimes, with the product from the vanners, passes to two conical-bottomed thickening tanks, 20 ft. in diameter by 12 ft. deep. From the collecting tanks the sands are removed by a Blaisdell excavator and a system of belt conveyors, which carry the product to the Blaisdell sand distributor; this spreads the product in the five leaching tanks, 36 ft. in diameter by 6 ft. 6 in. deep.

After receiving the necessary cyanide treatment, the sands are again removed from the tanks by means of the Blaisdell excavator and delivered to the tailings dump by belt conveyers. The slimes from the vanners flow to the sand separating trap, where any fine sand remaining is removed, and the slimes are pumped to the thickening cone-tanks. These tanks are arranged with a peripheral overflow, and a discharge from the bottom of the cone for the thickened pulp. The clear water flowing from the top of the tanks is collected and pumped to the mill supply tanks, 20 ft. in diameter and 10 ft. deep, by an 8x8-in. Deane single-acting power pump. The thickened pulp drawn from the cone, passes to two of the four agitators, 28 ft. in diameter and 16 ft. deep. This pulp is again allowed to settle, the water decanted and pumped to the mill supply tank.

The pulp remaining after decantation is transferred to a Butters 6-in. centrifugal pump, thence to a second agitator where the cyanide is added, and the mixture is then agitated the necessary length of time. After agitation and settling, the clear solution is decanted and the remaining pulp is pumped to a supply or stock tank, 28 ft. in diameter and 16 ft. deep, used with the Butters filter. From this tank the pulp is pumped to the 100-frame filter tank where the remainder of the solution is removed.

The filter plant includes, besides the tank and frames, a 6-in. Butters centrifugal pump, a 10x10-in. Knowles vacuum pump, and a Clayton air compressor used in removing the cake from the filter leaves. All gold and silver bearing solutions are carried to three gold solution tanks 20 ft. in diameter and one 30 ft. in diameter by 8 ft. deep. From these tanks the solution flows to the precipitating room, and the gold is precipitated on zinc shavings, ten zinc boxes completing the equipment. The barren solutions flow from the zinc boxes to three sump tanks, 30x8 ft., and from these tanks is again circulated by means of two Deane single-acting pumps, one 8x8-in. for the agitator solutions and one 4x6-in. for solutions used in the sand leaching department.

The precipitates containing the recovered values are reduced to bullion in the reduction plant which is equipped with a two-muffle furnace, necessary for roasting the precipitates, and also with furnaces for melting the precipitates into bullion.

The whole plant is wired for power and lighting, the power being conveniently distributed to the different points of the mill by 15 motors ranging from 150 to 5 horsepower.

The Mayflower

The Mayflower mine is situated seven miles northeast of Rhyolite and was formerly owned by two independent companies, the Starlight-Bullfrog Mining Company and the Mayflower-Bullfrog Mining Company; these were merged into one corporation late in 1906. The consolidation gave the new company an area of 11 claims, with 3500 ft. on the strike of the original Mayflower vein which runs directly through the former Starlight property. On the latter a 100-ft. prospect

*Selby, Cal.

shaft was sunk on the orebody; a crosscut at that depth revealed 22 ft. of excellent milling ore. Further along on the strike of the vein a double-compartment working shaft is being sunk and should cut the vein on its dip at a depth of about 225 feet.

But by far the main interest is centered about the shaft on the Mayflower ground proper. This is sunk on an incline of 65 deg., and at present has reached a depth of 500 ft., levels being cut at 100-ft. intervals. Lateral work on each of these levels revealed an immense body of milling ore, increasing in value about 20 per cent. with each level. In addition to the milling ore, a shot of high grade was encountered on the 300-ft. level in the course of the development, no stoping as yet having been done. A few sacks of this ore comprise the only shipments as yet made from the property, it being essentially a milling enterprise.

The first water was met in drifting for the vein on the 500-ft. level. The flow has increased rapidly until at present about 10,000 gal. are being hoisted daily by bucket. A Knowles duplex station-pump has been purchased and will be installed at once. The finding of water has solved a difficult problem, for the company had been hauling water for all purposes in barrels from a spring two miles distant. Also with the water question settled, plans for the mill, which have been held in abeyance for some time, will be carried out. The mill will be of 50-ton capacity, the process of reduction being amalgamating, concentration and cyaniding.

The mine is one of the best equipped in the district. A 12-drill, belt-driven, 100-h.p. compressor was recently installed. Hoisting is at present done by means of a 25-h.p. gasolene engine. The mine buildings are all good, substantial structures, and include two large bunk houses, boarding house, assay office and superintendent's residence.

The Tramps Mine

The property of the Tramps Consolidated Mining Company is situated on the western slope of Bonanza mountain near the edge of the town of Rhyolite. The first location was made on the property in September, 1905, by R. F. Sutherland, one of the pioneer prospectors of the district. His attention was first attracted by an enormous outcropping of quartz on what is known as Tramp No. 1 claim. This he located along with the Tramp Extension, Tramp No. 2 and Hoboe claims, all lying to the north of Tramp No. 1. To the west of these he discovered and located the Denver, Venture, Sidewinder and Tiger claims.

The Denver and Venture claims were sold to Philadelphia men, who incorporated them under the name of the Denver-Bullfrog Mining Company. Then Senator T. L. Oddie, of Tonopah, assembled the Tiger, Sidewinder, Tramp No. 2 and Hoboe into another company known as the Eclipse Mining Company. Shortly after this Sherwood Aldrich and associates, of Colorado Springs, purchased Tramp No. 1, and Tramp Extension, incorporating them into the Tramp Mining Company. These three companies operated independently for some time until it was decided that the work could be prosecuted more economically by combining. Therefore a consolidation of the three companies was affected in April, 1906, the new company being known as the Tramps Consolidated Mining Company, a corporation of 3,000,000 shares, 500,000 shares being placed in the treasury, and of which not a share has been sold.

The principal work on the property is in the Denver shaft which has been sunk vertically to a depth of a little more than 500 ft. This shaft has been in ore practically from top to bottom. A large amount of ore has been blocked out on the different levels, mostly of a milling grade, although some high-grade ore has been found and shipped to the Salt Lake smelters. Shoots of milling ore have also been opened up in tunnels on the Eclipse and Hoboe claims.

As yet no definite plans for a mill have been formulated although one is to be built ultimately. No water has yet appeared in any of the workings of the Tramps property.

The Gold Bar Mine

The Bullfrog Gold Bar Mining Company's property is situated about six miles east from Rhyolite, and consists of four claims. The development work in the Gold Bar is exceeded by only one other company in this district, that of the Montgomery-Shoshone. The Gold Bar management had completed 4861 ft. of development at the time of the last official report, Aug. 1, 1907. This includes the main shaft which at that time had reached a depth of 530 ft., with a station cut at the 450-ft. level.

A large amount of milling ore has been blocked out on the 150- and 250-ft. levels and the work for the past six months has been confined mainly to shaft sinking, as this work could be carried on more advantageously at the present than after the beginning of the extraction of ore. During the past year, also, the company has developed an ample water supply for milling purposes; a 10-stamp mill is now in course of construction at the mine.

According to a consular report, Dec. 27, 1907, considerable numbers of miners have arrived in Milan, Italy, from the Mediterranean and southern provinces, where they were out of work on account of the shutting down of the copper mines at Montecatini and elsewhere. The companies report a good year in 1907, but have suspended operations in order to await developments in the copper market.

The Key to the Situation

But neither lucky harvests nor partial monopoly in production of an agricultural staple, says the *Evening Post,* would guarantee us much greater prestige than what is claimed by Argentina, for example, were it not for another factor which has played an immensely important part in bringing on all our previous waves of industrial prosperity, which will play the same part again in the years ahead of us, and yet which probably could not have been invoked, on any of those occasions, but for the hard times which followed the collapse of each overdone industrial boom. The pressure of what we call adversity brought about on each of those occasions, application of the most careful economy in production.

Our manufacturers of 1896 and 1897 had become, under the spur of real necessity, cautious in their use of capital, alert in arresting waste, and vigorous in stimulating invention. The hard times were scarcely over before these indomitable Americans had proved their ability to undersell half of the outside world; a prodigious rise in export of American manufactures followed. In 1897, less than four years after the panic of 1893, the head of an European government publicly declared that against this "destructive competition" and to "successfully defend their existence," "European nations must close their ranks and fight." The metaphor was absurd, because Europe's people needed the manufactures which we sold them; but it found ready response in the excited outcry about the "American invasion," and it pointed to a real phenomenon of the day.

Why, one may possibly inquire, has no one heard an outcry, since 1901, over this sort of "American invasion?" The answer is, that industrial America had indulged in waste through excessive capitalization, had grown indifferent to economies, had blocked its own nearest purposes by forcing up prices artificially, and, in short, had deliberately thrown away all the supreme advantages with which it bestrode the markets of the world in 1897. The course of events which most of us are today engaged in lamenting is the shortest road to recovery of this former prestige. In due time we shall have recovered it, and shall once more be demonstrating to what extent America has the key to the future in its hands.

Apokonin, a dust-preventing material said to be a mixture of heavy residual oils obtained in the distillation of coal tar with high-boiling hydrocarbons, is described in London *Engineering.* The product is prepared for use by heating in iron kettles to temperatures ranging from 212 to 260 deg. F. The substance is sprayed upon the roadway with a special sprinkler.

High vs. Low Pressure for Compressed Air in Mines

By Robert B. Brinsmade*

In drilling with piston rock drills a high pressure gives a stronger withdrawing force on the bit which tends to prevent sticking in fissured ground and thus greatly increases the speed of boring. In hard, tough ground, like specular hematite or certain intrusives, a high air pressure is necessary, if it is desired to strike a blow, severe enough to cut the rock, with a light portable machine. In a certain mine, using 40 drills in hard and fissured ground the rock broken per machine was increased about 20 per cent. by the simple expedient of advancing the air pressure from 75 to 100 lb. A low-pressure system requires larger pipes to deliver the same power and heavier pumps and hoists in the mine to accomplish a given amount of work than an equivalent equipment working under high pressure.

The economical limit of pressure depends in a given case on commercial considerations, costs of fuel, labor and supplies, which in turn are governed in considerable degree by the mechanical efficiency of the plant. The high pressure limit adopted in this article is 120 lb.

It is wasteful to heat the air during compression to a higher temperature than that of the mine, as radiation in the pipe-line will cool any warmer air before it reaches the motor. A proof of this statement follows: Let V and P be respectively the volume and pressure of free air at the beginning of compression, and in the theoretical indicator card, Fig. 1, in which O is the origin of coördinates, let the abscissa of point a be V and the ordinate be P. Let v and p be the volume and pressure of air at any point of the stroke, during its compression by a reciprocating piston. Then if the temperature due to the heat of internal friction is retained in the air, we have adiabatic compression and get the curve $a\,b\,f$, the equation of which is

$$p = P V^{y}\left(\frac{1}{v^{y}}\right),$$

the value of y being 1.406 for dry air and somewhat less for the ordinary atmosphere, and p being the resultant pressure and v the resultant volume.

If the temperature is kept constant during compression, by removing the internal heat as fast as generated, we have isothermal compression and get the curve $a\,c\,d$, the equation for which is $p = P V\left(\frac{1}{v}\right)$. Finally, the work lost by cooling the air, from the final adiabatic temperature to that of the free air, is measured by the area $a\,c\,d\,f\,b$, the total work of compression for one stroke of the piston being area $a\,f\,m\,n$.

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Theory of the Intercooler

Although isothermal compression is the ideal, practical difficulties prevent its attainment. The air can be cooled in the compression cylinder by a water spray, but this method requires too slow a machine to compete with dry compression and external cooling. It can be easily shown, mathematically or by an indicator card, that water-jacketing the compression cylinder has practically no effect in cooling the air, although it is useful in keeping the bearing surfaces cool enough for lubrication.

In Fig. 1, the adiabatic and isothermal curves get farther apart as the pressure increases, so that the work lost by adiabatic compression increases at a faster ratio than the pressure. To avoid this increase for high pressures, a compression in two stages, with a surface intercooler between the high- and low-pressure cylinders, is frequently used. Unfortunately, few of the standard machines have a large enough intercooler to insure that the compressed air, entering the high-pressure cylinder, is as cool as the free air entering the low-pressure cylinder when the machine is running full speed. It will aid the intercooler, if the free air is sucked into the low-pressure cylinder from the coolest available place.

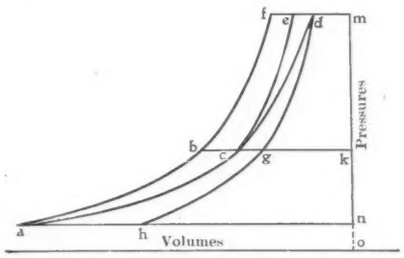

FIG. 1. VOLUME AND PRESSURE IN AIR COMPRESSION

In the diagram, Fig. 1, K is the pressure at which the air leaves the low-pressure cylinder to pass through the intercooler and enter the high-pressure cylinder. The following cycle then takes place with a perfect intercooler. In the low-pressure cylinder the air is compressed adiabatically from a to b, reduced in the intercooler to the volume at point c and then compressed adiabatically in the high-pressure cylinder from c to e, the total work of compression being the area $a\,b\,c\,e\,m\,n$. Thus the saving of work by the use of the intercooler is represented by the area $c\,e\,f\,b$, from which must be deducted any work expended in circulating the cooling water. In the design of the machine, the ratio of the diameters of the low-pressure cylinder and the high-pressure cylinder are taken so that the area $a\,b\,k\,n$ is equal to area $c\,e\,m\,k$ for average conditions.

There need be little difference in the efficiency of the steam ends between high- and low-pressure compression. With a cross-compound air end, the steam end can also be compound and for a single-stage air end the machine can be tandem compound. The air-pressure governor has now been perfected and for the usual variable loads of mine work, is indispensable for any pressure, though it requires a duplex machine to avoid a stoppage on dead center with no load.

Preheaters

In the case of the air motor, the compression process is reversed. The air on entering the motor in the mine has the pressure and volume of point d (Fig. 1) and in a simple, unheated motor cylinder will expand adiabatically along the line $d\,g\,h$. Should the air be preheated to the volume of point f it will then expand along the adiabatic line $f\,b\,a$ with a gain of work, over the unheated case, equal to area $a\,h\,d\,f$.

With two-stage expansion, the air may be preheated before entering the low-pressure cylinder to e, then expand adiabatically to c, next pass through an interheater so as to reach b on entering the high-pressure cylinder and finally expand adiabatically to a. Heating during expansion, like cooling during compression, gains in its relative effect on the efficiency, the higher the pressure. Aside from its gain in work, heating is often necessary to prevent freezing of the exhaust when the air is damp and cold on entering the motor.

Owing to the small size and portability of rock drills preheaters are for this service out of place, but for large hoists and pumps, with high-pressure air, they are always to be recommended. In the operation of the preheater the compressed air passes through a vessel containing heated tubes of sufficient radiating surface for the purpose. These tubes may be heated by a coal, coke or oil fire, but, since smoke contaminates the atmosphere of the mine steam heating is often both convenient and economical. In an air heater it is possible to utilize steam more efficiently than in the best condensing engine, for both the latent and visible heat of the steam are absorbed by the air and turned into work without frictional losses greater than the motor would suffer with unheated air. With steam heating the only important loss is that due to radiation in the supply pipe from the boilers, and by proper covering this can be made small. In the 500-gal. Dickson pumps, installed in the Anaconda mines at Butte in 1899, the air was successfully heated by steam in both the preheaters and the interheaters for the compound cylinders.

High-pressure pipe-lines, though smaller in diameter, require more care to keep them tight than lines for low pressure, and the velocity of exit of air from a leak varies directly as the square of the pressure.

The loss of power from the common practice of blowing out powder smoke with the air hose is the greater the higher the pressure, for the ventilating efficiency depends only on the quantity of free air discharged. With pipes properly proportioned for the quantity of air to be delivered the frictional line losses will be moderate with either pressure, if care be taken to avoid unnecessary bends and to use gate valves instead of globe valves.

The compressor should discharge its air into a receiver the cooling action of which will not only at once reduce the volume to that which it will have in the mine, but will also precipitate any extra moisture and keep it from entering the pipe-lines. A good device for the surface receiver is a condemned boiler, set in a wooden tank in which is water circulating through the boiler tubes, while the compressed air fills the shell. Underground the receivers need only be plain steel shells for storage, but they must be numerous and large enough to preserve the pressure constant under the variable power requirements. Preheaters in use serve as receivers.

The London Copper Market in 1907

SPECIAL CORRESPONDENCE

The persistent advance in prices during 1906 had raised the value of Standard copper to £104 15s. for cash warrants, and £106 2s. 6d. for 3 months'. The trade had become accustomed to this new range of prices; it was manifestly due to increased consumption, and not to speculative manipulation such as had been widely suspected in the earlier history of the movement.

January opened with business restricted by holiday influence and by the usual cessation of enterprise during stock-taking at works. An initial advance of 5s. was quickly lost after publication of the fortnightly statistics showing an increase of 1866 tons in the visible supply. This induced heavy realizations and aggressive bear sales whereby values were depressed. A recovery ensued when it became known that there was genuine scarcity in America, where producers were unwilling to commit themselves far forward even at the high prices. Trouble in the money market was manifest about Jan. 9 when further heavy realizations were recorded; but the market was steadied by important purchases for American account, and the consequent removal of weak elements. Thence forward the most notable feature was the engagement of heavy freights to carry supplies of unrefined copper from England to America, where the congested railway traffic and the scarcity of fuel and labor combined to impede transport and treatment. Fully 2000 tons were thus removed from English warehouses, and consignments of material from Chile, Japan and Australia were diverted to American ports for the same reason. Fluctuations in price, however, were at no time very wide, any sensational advance being always checked by the liquidation of bull accounts as well as by the persistent weakness of the American stock exchange. The highest closing price of cash Standard was on Jan. 14, £109. The month closed with cash warrants £106 5s., and three months' £107 7s. 6d.

February opened with an advance of £1 per ton, induced chiefly by a decrease of 3470 tons in the visible supply during the latter half of January. This remarkable decrease was known to be due to heavy withdrawals from English warehouses for shipment to America. Large buying orders raised the price on Jan. 4 to £109 for three months' warrants after which bulls and bears contended with varying success and with moderate fluctuations. Meanwhile speculation was stimulated by a general improvement in the value of copper shares, as well as by a steady American demand both for rough and refined sorts. Large English and foreign government and other contracts were placed about this time, which helped to enhance the value of refined copper, both for prompt and extended deliveries. Toward the close there was abundant evidence of producers' inability to cope with trade requirements and speculation revived, bears hastened to cover their commitments, and the upward movement was only partially restrained by the liquidation of old holdings. Closing prices were £108 15s. for cash warrants, and £109 15s. for three months'.

March opened with every prospect of improvement in trade. Statistics revealed a persistent diminution of stocks, refined sorts being particularly scarce, and new orders coming in to an extent which caused some anxiety as to the sufficiency of supply for April and May requirements. A severe slump in American securities early in the month had little effect on copper beyond the liquidation of some bull accounts, for the market was evidently oversold, and it was manifestly unsafe to take liberties with it. A prompt recovery in American securities was followed by the covering of bear sales and a consequent advance in prices; but a reaction set in, prompted by renewed trouble in American finance. On Jan. 26 three months' warrants touched £97. Thereafter confidence gradually returned. Throughout this episode it was felt generally that the speculative element could not long disturb the value of copper as gaged by the elementary test of demand and supply. A sharp recovery on the 27th raised the price of three months' by £4 5s., which was a little too sudden for so disturbed a market; and the close was calm and steady at £97 10s. for cash warrants, and £99 10s. for three months'. It is noteworthy that, even when values were most depressed, important producers would concede no reduction in their prices, notwithstanding newspaper reports to the contrary. Another indication of underlying strength was the publication of statistics showing that the world's total output of copper during 1906 was barely 4½ per cent. in excess of that of the previous year, in spite of record prices having prompted producers to increase their output by every means in their power.

April opened hopefully, chiefly on improved reports from Wall Street. On the morrow, however, adverse conditions prevailed, the newspapers reported lower prices for Lake Superior copper, statistics revealed an increase in the visible supply, and the market was unprepared for the quantities offered. The result was somewhat of a panic, in which prices fell sharply to £93 for delivery late in June, and £92 for April dates. At these reduced values bear commitments were largely covered, and a recovery followed which was almost as sudden as the fall had been. The available supply of Standard copper was found to be much reduced, thereby threatening a cornering of the bears, while the relative dearness of refined sorts pointed to further depletion of the Standard stock for conversion into refined and for other purposes. On Apr. 10 values had recovered to £99 12s. 6d. both for spot and forward. Then followed reiterated reports of lower bid prices in America, which of itself was of no real significance, but which came at a moment when renewed unsteadiness in Wall Street had caused widespread apprehension. Later, however, operators were more alert to judge copper on its own merits rather than by the vagaries of the share market. The result was a steady advance in values up to the end of the month, when cash warrants stood £104 10s., and three months' £103. Meanwhile producers were very firm, and the Rio Tinto Company disposed of its entire production for May at the record price of £114. The renewal of the German Steel Syndicate for a further term of five years served to impart additional confidence to the metal markets generally, and to induce active covering of recent bear sales of copper to an extent which caused warrants for May and June dates to command substantial premiums over the cash value.

May opened with a strong tendency. Statistics revealed a further reduction of 822 tons in the visible supply, and prices rose sharply to £108 for June warrants, and £107 10s. for May dates. This was due to sudden panic among the bears. It was promptly followed by realizations which dropped the cash price £2 10s., notwithstanding a large business in refined sorts. Thereafter prices drifted downward, chiefly in consequence of trouble in the American stock markets and conflicting reports about American crops. At this point there was a rally, it being evi-

dent that the larger American producers were firm in maintaining their selling prices. The mid-monthly statistics showed a further decrease of 1355 tons, and the trade appeared bare of stocks. The strike of longshoremen in New York harbor also threatened to curtail the supply to Europe. At the same time the general trade seemed sufficiently sound, though consumers were cautious in buying. There was, however, but little pressure to sell. There were factors in favor of copper maintaining its value, and statistics apparently showed that production up to date had fallen short of that of the corresponding period in 1906. The market, however, was influenced largely by the further shrinkage in American securities, and consumers generally postponed their purchases, though producers everywhere maintained prices firmly. The Standard market alone showed instability. A fall was followed by a sharp recovery, and the month closed at £101 5s. for cash warrants, and £98 for three months'.

June opened with business restricted by persistent depression on the Stock Exchange, and the general uneasiness engendered thereby. Producers held firm, but dealers were eager to secure the orders obtainable from consumers. Stale bull accounts were liquidated, and bears were encouraged to sell, whereby prices were depressed down to £94 15s. for cash, and £91 5s. for three months'. This proved to be low-water mark, and a sharp recovery was induced by bargain hunting followed by eager bear covering. Trade in manufactured sorts had revived considerably, notably in copper tubes, sheets and wire, as well as in yellow metal and brass; but consumers bought reluctantly in consequence of a persistent rumor of an impending cut in the leading American prices. Dealers were in many cases anxious to market their holdings, as it became apparent that American electrolytic copper was selling in Europe at prices relatively cheaper than those officially quoted from New York. On the other hand, the leading producers emphatically denied all intention of cutting prices. The latter part of the month was a period of much uncertainty and tension. It finished under improved conditions on the Stock Exchange, with consumers very barely supplied, and English smelters obliged to encroach on stocks in public warehouses in order to meet the demand for refined sorts. The premium on prompt and early warrants increased throughout the month, which closed at £98 for cash, and £91 15s. for three months'.

July found consumers generally bare of stock and obliged to buy. Business was further stimulated by advancing values in the share market, wherein copper shares were prominent, as also by higher quotations for the metal in America. The result was a persistent advance in London prices, notwithstanding an increase in the visible supply. On July 9 came news of the simultaneous reduction in price of electrolytic copper by two of the leading American producers. This, coming after frequent and emphatic semi-official assurances to the contrary, initiated a rapid decline which brought trade to a standstill. July 16 a persistent rumor of a further reduction in the American price caused cash warrants to fall to £89, and three months' to £85 10s. When, however, it was known that the American price was firmly maintained, there was a general rally until the bears had been tightly squeezed and had paid the penalty; thereafter the backwardation narrowed considerably. The market was now very sensitive and trade was restricted. Orders for manufactured articles were not large and were for early delivery only. The Rio Tinto company after vainly awaiting the opportunity to market its June and July output advantageously, now sold moderate quantities at £98. The closing days of the month found the general sentiment rather pessimistic. Meanwhile the Calumet & Hecla company was selling Lake copper in Europe at £100. This induced a general decline to £86 10s. for cash Standard warrants, and £83 for three months', whereat the month closed.

In August, the conditions restricted business at the outset, and a continual decline in prices was registered during the first fortnight. Meanwhile American producers were making further concessions, and the situation was aggravated by something like a panic in Wall Street. During this period only urgent requirements were covered, holders of the metal were disheartened, and buying was mostly in the nature of bear coverings, which fell away very rapidly and the lowest price was touched Aug. 13, when three months' warrants changed hands at £73 10s. By this time it became manifest that there was a large accumulation of orders held back by reason of the persistent fall in prices. With the first sign of recovery these orders began to come out, moderately at first, but in gradually increasing volume, and a large business was done with manufacturers at home and abroad until the market was weakened by unfavorable American advices. The stock markets had recovered from recent depression, but copper was under the shadow of uncertainty as to the intentions of leading producers in Europe and America, particularly the latter, there being a prolonged struggle between the producers, who were credited with having large accumulations to dispose of, and consumers who had abstained from buying while hoping for further concessions in price. Toward the end of the month there was an active business in electrolytic sorts for wire drawing, and orders for manufactured sorts were largely given out for the Indian markets. The Standard market, however, was unsettled by the prevailing uncertainty, and the cash price closed at £76 5s., three months' being held for £75 10s. The gradual shrinkage of the premium on cash warrants tended to impart confidence.

September opened with the situation in America unsettled, both financially and industrially, and the market was ripe for a further fall in prices. Some business was booked by manufacturers in Europe during the early part of the month, and a large amount of covering took place in standard copper round £74; but the pessimistic sentiment prevailed, and the further decline could not be arrested. Concessions in price by the leading American producers were freely undercut by the lesser companies, and bears were thereby encouraged to push sales in London. The fall was persistent down to Sept. 16, when there was a general rally, and a large business was put through at about £67. Important orders were booked for India and China, and the general manufacturing industries were actively employed, sulphate of copper also showing expansion. Consumers' wants in many cases were urgent, and available stocks showed considerable shrinkage. The disturbing factor was the persistent drop in the American price, coupled with apprehension of further sacrifice in order to get rid of accumulations of the metal. The London prices suffered in consequence, notwithstanding prevailing activity, and the month closed with cash Standard £64, and three months' £63 17s. 6d.

October will long be remembered for the acute financial crisis which developed in America and which disturbed values of all commodities. At the opening there was a general desire to liquidate holdings of all kinds. Consumption of copper showed signs of slackening, and retrenchment prevailed. Prices dwindled almost uninterruptedly down to Oct. 23, when cash warrants closed at £55 10s., and three months' at £55. During that troubled period the London price was frequently lower than the New York parity, and successive reductions only served to discourage enterprise. The accumulations of the metal in America were regarded as sufficient safeguard against any sudden turn of the tide, so that consumers bought reluctantly and only to cover urgent requirements. One curious feature was the scarcity of spot warrants, which commanded a premium throughout, at one time as much as £2 per ton. The one hopeful feature was the general report of drastic curtailment of output from nearly all the American mines, particularly in Montana. Consumers, in Europe at least, continued well employed on old orders, notwithstanding the paucity of new ones. The lowest price actually

touched was £54 10s. for three months' warrants. The turning point was reached when the American producers, frightened by the financial crisis in New York, threw over large quantities of refined copper at around £55—a price which at last attracted European dealers and tempted them into buying on a considerable scale. The trade followed their lead and a remarkable activity was soon apparent. Consumers hastened to buy considerably in advance of their actual requirements, and were able to take advantage of the liberal offers from America. The bear account at this time was not particularly large, but was quickly covered. Orders for the manufactured metal had been long withheld and were now given out freely, Indian purchases being on an important scale, and Chinese still more so. The fourth week of the month witnessed the record turnover of 15,000 tons. Meantime American producers, having sold largely in Europe, were less anxious to sell for home consumption. American consumers, finding producers so independent, paid an advance. The closing days of the month saw the market active and buoyant, notwithstanding the stringency of the money market. Final values were £66 for cash, and £65 5s. for three months'.

November opened with a sharp rise but quietness soon followed, as was natural, for consumers had by this time covered their requirements, and were content to await developments before operating further. The Bank of England's official rate of interest was raised successively to 7 per cent., and a similar movement prevailed in other countries. Copper seemed a hopeful market in view of the large disposal of American accumulations and the reduced output from the mines; but values were very sensitive to financial influences, and prices receded to £57 5s. A temporary improvement at this point was of short duration, the relapse being mainly due to financial stringency coupled with the inability of American consumers to absorb further quantities, and fluctuations remained within narrow limits. The mid-monthly statistics revealed an increase of 3057 tons in the visible supply, which tended to check enterprise. On the other hand, it was manifest that European industries were well employed. A general improvement set in. The increased supplies in Europe were readily absorbed by the trade, and a considerable business was done for delivery extending well into the next year. Electrical enterprise showed marked revival, and the Indian trade in copper and yellow metal sheets developed a welcome activity. Quantities of copper which would otherwise have gone to Europe were diverted to China. The Australian output was found to be considerably checked since recent high prices had relapsed. Thus the latter part of the month was distinctly more hopeful as regards trade, though the closing days witnessed some depression of prices due to profit taking and occasional bear selling Closing values were £62 10s. for cash warrants, and £63 for three months'.

December failed to fulfil the hopeful prognostications of the preceding month, the causes of financial uneasiness being too deep seated to admit of speedy removal. Consumers restricted their purchases to immediate requirements, and these were unimportant. Manufacturers continued well employed in the execution of old orders, but found new business very meager. The rapid shifting of American accumulations of metal to European ports caused a plethora of refined copper in Liverpool and elsewhere, with the natural consequence that spot warrants were pressed for sale, and the contango widened to 30s. During the first week prices improved irregularly, but the pervading depression was too manifest for investors to retain their optimism, and prices thereafter fell away, but without attracting much business anywhere. In the absence of any genuine stimulus, manufacturers were careful to restrict their purchases, especially in view of approaching holidays and general stock-taking, and with evidence of an abundant supply in cases of need. Prices declined gradually until Dec. 12, when £58 15s. was accepted for three months' warrants; at which point there was a rally caused by a moderate influx of buying orders from manufacturers both in Europe and America, bears at the same time covering their commitments. The market closed firm on Dec. 28 at £62 for spot Standard copper, and £62 15s. for futures.

Notes from the Transvaal

SPECIAL CORRESPONDENCE

Disquieting rumors have been circulating on the Rand for some time concerning the outlook of the City & Suburban gold mine, one of the large properties of the Central Rand. The monthly profits have been steadily dropping on account of a serious fall in the value of the rock. It is stated that the development is far from satisfactory, and to all appearances this mine has several lean years in front of it. It is not often that the public is called upon to witness a serious decrease in the monthly profits of any one of the mines of the Central Rand, and the drop at the City & Suburban has come as a shock to many people. It is not a favorable indication for the deep level properties south of this mine, where shaft sinking is now going on to strike the reef.

The annual report of the Consolidated Goldfields of South Africa is usually one of the most interesting mining reports of the year. In the recent report some interesting remarks are made on the policy of the Government in re-patriating the Chinese, and fear is expressed that when the whole lot of coolies are sent away, great difficulty will be experienced in maintaining the labor supply. Reference is made to the search for a small stope drill, to break rock in stopes where hand labor is now employed, and great hopes are expressed that before long a thoroughly satisfactory drill will be brought out. The report draws attention to the reduction in working costs that has come about during the past year. An interesting table is given to show how the working costs for the past year are made up, as follows: White wages, 34.98 per cent.; colored and Chinese wages, 19.07; stores, 37.88; sundries, 8.07; total, 100. These figures of the Goldfields group are typical of the Rand. It is a striking fact that 54.05 per cent. of the total expense of getting the gold is paid out in wages bills.

On the whole the state of the share market has improved of late. There is far more demand for dividend-paying mines and not such a scramble for the highly speculative, valueless trash that has been so popular in South Africa. Many of the shares now stand at a figure—including the risk of the future—which warrants one buying them as an investment.

Diamond shares have been rather weak. One reason for this is the report made on Robert Victors, a large diamond property which was very popular with the public. Those shares stood at £9 to £10 some months ago, and were considered good buys then, but today they are selling at £1 15s. to £2. There is nothing more speculative than a diamond share.

The problem of the unemployed is more pressing than ever. Many white men are doing manual labor in the municipality of Johannesburg for starvation wages. A delegation of the men interviewed the Colonial Secretary in Johannesburg, and prayed that the Government hasten to start more work. The tin-mine scheme, which the Government started off with such a flare of trumpets, is doing little or nothing to relieve the distress.

Tin Production of Australia

Consul-General John P. Bray, of Melbourne, reports that 12,091 tons of tin, valued at over $7,300,000, was produced in Australia during 1906, being 1725 tons more than in 1905. The following quantities of tin were mined last year in each of the producing States: New South Wales, 1300 tons; Queensland, 4823 tons; Tasmania, 4473 tons; and Western Australia, 1495 tons.

A note in the London *Engineer* says that the occurrence of spinel in blast-furnace slags appears to have been first determined in 1880 by Muirhead, who found that highly aluminous slags left a proportion of very refractory residue varying from 5 to 17½ per cent. of the whole weight. This when analyzed proved to be spinel, with about one-third of the magnesia replaced by iron.

The Price at which Profits Vanish

By J. R. Finlay*

At a time like the present, when our minds are full of the ideas developed during the prosperous times of the last 10 years, it is easy to say that prices must rise because commodities are selling below the cost price. An analysis of the situation, however, soon shows that with a diminishing output certain adjustments are possible that render this conclusion fallacious. To show how this works out with regard to mining companies, I shall take an example picked out almost at random, as follows:

Taking the report of the Federal Mining and Smelting Company for 1907 we find that it shows net profits of $2,532,249, but it writes off for "development account" $300,000. It is therefore prudent to assume that the real estimate of profits should be only $2,232,249. This came from 130,373 tons of concentrates containing 3,689,298 oz. silver (worth 68c. per oz. or $2,508,000) and 59,746 tons lead worth $116 per ton or $6,930,000, the total gross value being $9,438,000. On this output the profits amount only to 23.5 per cent. and the costs must therefore be 76.6 per cent., giving an apparent cost for lead of 4.41c. per lb., and for silver of 51.75c. per oz.

At first blush one is apt to assume that with present costs there would be no profit to the company unless the prices received were above 4.41c. for lead and 51.75c. for silver. How false such an assumption would be appears from the following:

The Cœur d'Alene mining companies do not smelt their own ores but sell them to smelting companies under contracts somewhat as follows: The smelter pays for 90 per cent. of the lead at 90 per cent. of the New York price or 81 per cent. of the full quantity and price when lead sells at 4.10c. or under. When the price rises above 4.10c. the smelter pays 81 per cent. on ½ the additional price. Thus if lead sells at 4.50 the smelter pays 81 per cent. of 4.10 + ½ of 0.40 = 3.52½. The smelter pays 95 per cent. of the full value of the silver. A freight and treatment charge of $16 a ton is deducted from the value of average concentrates. Applying this rule to the output for 1907 we find that the cost of producing concentrates was about $22.85 a ton.

Now let us see what would happen to the Federal Mining and Smelting Company were the prices reduced to the point where the profits apparently vanish according to 1907 experience. The concentrates contained: Lead 45.9 per cent., 918 lb., and silver 28.4 oz. per ton. The value is figured as follows:

	Selling Price.	Contract Price.
Lead	4.41	3.47
Silver	51.75	49.16
918 lb. lead		$31.85
28.4 oz. silver		13.96
Total value		$45.81
On this our costs are		
Freight and treatment		$16.00
Mining		22.85
Total		$38.85

We have a profit remaining of $6.96 per ton. This on 130,373 tons would be $907,000 or 40 per cent. of the profit at 1907 prices. On this basis we may figure the real vanishing point for lead as follows:

Let the silver price remain stationary and we shall have in our concentrates silver worth $13.96. Our cost is $38.85; therefore the 918 lb. of lead must be worth $24.89 or 2.71c. per lb. But as this is only 81 per cent. of the selling price the latter will figure at 3.34c. It would seem therefore that we have reached the vanishing point of profits so far as the Federal Mining and Smelting Company is concerned with lead at 3.34c. and silver at 51.75c. at New York.

But here again the deduction is not legitimate. The company has a chance to select its ores and produce a higher-grade product. Suppose it produces from its more favorable mines only 65,000 tons of concentrates instead of 130,000 tons and that the selected concentrates carry 56 per cent. lead and 38 oz. silver. Suppose this ore cost 10 per cent. more for mining and 12½ per cent. more for freight and treatment and we have a cost of

Mining	$25.00
Freight and treatment	18.00
Total	$43.00
But the ore will be worth as follows:	
Lead, 1120 pounds at 2.71	30.35
Silver, 38 ounces at 49.16	18.68
	49.03

Thus we have a profit of $6.03 still or about $400,000 and in addition the company is keeping in its mines a very large amount of ore that will be available at better prices. With the above grade of concentrates, supposing that silver remains the same, the vanishing point of profit on lead will be reached at 2.17c. by contract or about 2.68c. at New York.

Even yet we have not reached the limit of the company's resources. Wages and costs in general have not been reduced. It is safe to say that if lead had to be sold at 3c. per lb., supplies to the mines would be cheaper and wages could be reduced. I think therefore it is safe to say that the good mines of the country could, if compelled to, mine a great deal of lead at 3c. per lb. at New York. The same thing may be said of other metals. There is nothing in the situation today to render it impossible that copper might sell at 9c. per lb. as it did in 1894, nor that pig iron should sell at $10 a ton as it did in Pittsburg in 1896.

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Nova Scotia Steel and Coal Company

The output of coal for 1907 was approximately 650,000 tons from three collieries, the new pit opened at Point Aconi in June contributing only about 1000 tons. A spur railway 2¼ miles long, connecting this mine with the company's main line was finished. The work of pumping out No. 2 colliery, abandoned in Nov., 1904, is making good progress, the water being lowered at the rate of 30 to 40 ft. per day. It is expected that production can be begun by March. No. 3 colliery, the largest producer, was on single shift during the year, which accounts for a slight decrease in the total output as compared with 1906.

In the steel plant every department shows an increase over the output of the previous year. The production of pig iron was approximately 59,000 tons, an increase of 10,000 tons over 1906. The steel production was about 71,000 tons, an increase of 20,000 tons. The coke output was also largely in excess of that of 1906.

The company is developing its submarine iron ore areas adjoining those of the Dominion Iron and Steel Company at Bell Island, Newfoundland. The Dominion Steel Company's territory extends one mile from the shore and beyond this is another mile of rich ore areas owned by the Nova Scotia company which is tunnelling under the areas of the Dominion company to reach its own land. Borings indicate that the submarine areas of both companies contain between five and six hundred million tons of ore.

Model Mining Villages in France and Belgium

Consul H. Abert Johnson, in a report from Liège, gives details of a coal-mining enterprise in Belgium which is planning to establish a model mining village, and has engaged as manager an engineer in charge of a mining plant at Bethune, in France.

The mine at Bethune employs 8000 men. There are 2000 dwellings that are rented to the miners at $1.15 to $1.54 a month. The houses, with gardens attached, are arranged in attractive villages, with broad streets and boulevards. Churches and schools have been built; the water supply, sanitary arrangements, and the electric-light plant are all of the most modern and up-to-date class.

A visit to Bethune proved highly satisfactory to the officials of the Limbourg region and has tended to strengthen their determination in building up their new organization to follow as closely as possible the model set by the French mines.

In driving a tunnel, the force of the explosive is most effective if placed in a pocket at the bottom of the drill hole.

The Middlesboro Coal Field, Kentucky

A District Possessing a 5-foot Seam, Which Is Mined Entirely by Drifts and Slopes. Many Difficulties in Railway Construction

BY JOHN HOWARD*

To the superintendent and mining engineer, the Middlesboro Coal Field presents a never ending series of interesting problems, some of which remain to be solved. Many noteworthy feats have been accomplished, however, and it is principally to these that I shall here refer. It would be impossible, in the space permitted, to make reference to all the operations in the district, so I shall mention specifically only three, these being the Fork Ridge Coal and Coke Company, the Sterling Coal and Coke Company, and the Yellow Creek Coal Company. Their operations represent the three types of mines in the district: no incline, medium length incline, and long incline. There are no shaft mines in Eastern Kentucky, nor in Tennessee; all of the operations being "drift" mines.

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Transportation Problems

In discussing the engineering accomplishments in the Middlesboro district, let us first look at the railroad spurs; there are two of these: the Bennetts Fork Branch, and the Stony Fork Branch, both using the same track for the first three miles from Middlesboro, and each extending seven miles beyond the junction. Grades as high as 5 per cent. are found on the Bennetts Fork Branch and curves as sharp as 12 deg. Two switchbacks were used on the Stony Fork Branch as it was impossible to reach the tipple sites with any practicable grade.

The Fork Ridge Coal and Coke Company has its plant on a spur track of 1.5 miles leading off from Bennetts Fork Branch six miles from Middlesboro. This spur goes up Cabin Fork, which is narrow and crooked, with considerable rise in elevation, and here it is that a 5 per cent. grade had to be resorted to. A 100-ton engine can push up only eight empty gondolas.

The Fork Ridge Mines

The Fork Ridge mines have two drift mouths and two tipples. On the "fan side" the coal is brought out at tipple hight, while on the "slope side," a trestle 700 ft. long has been built crossing the railroad tracks 30 ft. overhead and a slope has been driven down to the coal. This trestle and slope have been fitted with continuous rope haulage.

The Fork Ridge company constructed a switchback and another track extending 1.5 miles up Cabin Fork above the present operation. The grade on the backswitch is 2.25 per cent., and on the 1.5-mile extension it is 3 per cent. This track, together with

FORK RIDGE COAL AND COKE COMPANY. FAN TIPPLE AND STORAGE TRACKS

an incline of 2000 ft., reaches a seam of coal 5 ft. in thickness. The lease of the Fork Ridge company comprises 3000 acres of the best coal in the district, and there are several seams. Both mines are fitted with electric haulage and electric fans, the average daily output being 1200 tons. The output is all shipped to the Southern Railway as mine-run coal. The Fork Ridge company has the most complete equipment of any mine in the district and employs 400 men. Its main offices are at Fork Ridge, Claibourne county, Tenn.

Sterling Coal and Coke Company

Reached by a one mile backswitch from the end of the Bennetts Fork Branch is the plant of the Sterling Coal and Coke Company, the main offices of which are in Middlesboro, Ky. The Sterling operation is a type of the medium length incline, only 1000 ft. being necessary. The grade on the switchback and extension was almost 4 per cent., and at the tipple and on the storage tracks above, even a steeper grade had to be resorted to.

From the drift mouth to the head of the incline a long trestle had to be built, and to find a place for the buildings and miners' houses was a problem. Near the summit of the mountains, the town has been built, where the hillsides are so steep that the cottages perch on the slopes while a wagon road has been blasted out of the rock. The Sterling Coal and Coke Company now ranks second in production in the district, being surpassed only by the Fork Ridge company.

Although one of the newest operations on Bennetts Fork, the Sterling Coal and Coke Company has forged rapidly to the front. It is a monument to the enterprise and ability of the first president of the company, Judge J. L. Mauring, of Middlesboro.

Few Companies Use Mining Machines

The Sterling mines are a good type of the up-to-date progressive operations of the Middlesboro district. Electric haulage and ventilation have been in use here from the beginning and the fact that the mines were fully equipped from the start is the secret of the rapid increase in production. The Sterling mines are supplied with an excellent pumping outfit, and electric mining machines. But few of the mines in this part of Kentucky use the mining machines as the coal works easily with the pick and the men prefer to mine it that way, in preference to loading behind machines. The Sterling coal is somewhat harder than the other coals in Bennetts fork, and the machines have proved successful.

STERLING COAL AND COKE COMPANY. YARDS AND SHEDS AT HEAD OF INCLINE

A MOTOR TRIP COMING OUT OF THE DRIFT MOUTH

The Yellow Creek Coal Company's plant on Bennetts fork is a type of the long incline, though the length, which is 1900 ft., would be considered short in some localities. This incline reaches the lower or No. 2 mine, while beyond this a 600 ft. retarding conveyor goes up to the No. 3 mine, making in all 2500 ft. that the coal from the top mine must be transported down the mountain side to get it into the railroad cars.

On all the inclines in this section where retarding conveyors are not in use, gravity haulage is employed by using a wire rope and a large drum. The drum at the Yellow Creek mines is 10 ft. in diameter and 15 ft. long, and a rope 1⅛ in. in diameter is used with it. The coal is lowered in monitor cars holding from six to eight tons, the weight of the loaded car pulling up the empty one.

The Yellow Creek incline is laid with three rails, with a section 150 ft. long, where four rails are used so that the cars can pass each other. By using the three-rail system, latches or switches are avoided and all danger of wrecks from imperfect connection at switch points is eliminated.

At the foot of the incline of the Yellow Creek Coal Company, there is a trestle about 200 ft. long on a 4 per cent. grade. As the landing place at the top is on a steep incline, the cars have to be run with accelerated speed to carry them across the trestle. This necessitates a good track on the incline, and the Yellow Creek people having

realized this, laid the incline with 58 lb. steel.

A Peculiar Coal Formation

In the Number 3 mine at Yellow Creek was encountered an unusual formation of the coal. After driving the main entry 600 ft. in 5 ft. of coal, a small dirt seam began to show, and this rapidly increased in size until the bottom part of the seam was abandoned. Following the top seam, the entry was carried for some distance through coal 2 ft. thick. The entry was also gaining rapidly in elevation. After driving 900 ft., the elevations were taken and showed the face of the entry, where there was just 2 ft. of coal, to be 32 ft. higher than the drift mouth. The levels were then taken a half mile around the mountain to a prospect hole where the coal showed the full 5 ft. in thickness, and this prospect hole showed 13 ft. in elevation below the drift mouth.

As the heading in the main entry was 32 ft. above the drift mouth this prospect hole was 45 ft. below the main heading. Taking the levels up the side of the mountain 45 ft., there was found a seam of coal just 2 ft. thick. Here then were two veins of coal which had been formed by a split of the original seam.

A new drill was started in the prospect hole where the coal showed 5 ft. thick and this was driven in a distance of 100 ft., when an entry was turned off at right angles to the old main entry. This right entry was driven 396 ft. to a point in the line of the old main entry, and an entry started back to drive under the old main. In driving back, the coal which was 5 ft. thick, split again and the top bench or stratum was followed; after driving 400 ft. a hole was shot through to the old entry and the distance was found to be 17 ft. A roadway was then shot out of the solid rock and a haulway coming out at the old drift mouth was secured, with a grade of 1.5 per cent.

There were three distinct seams of coal, an upper and a lower bed 45 ft. apart and another seam connecting the two. It is of interest to know that after the two lower seams came together no parting thicker than 3 in. has ever shown, and already about 30 acres of the coal has been worked out.

Electricity Used at Several Mines

The Yellow Creek Coal Company has been one of the most progressive operations in the district. This company was the second one to install electric haulage and electric fans, the Bryson Mountain Coal Company being the first. Both of the Yellow Creek mines are equipped with 10-ton Goodman motors and the power fans are also driven by electricity. The power house can be seen in the illustration at the left of the tipple.

The Mingo Coal and Coke Company installed the first operation in the Middlesboro district and this company has the honor of putting in the only coke ovens in the field. These are not now in operation, owing to the fact that the price for coal is unusually high and it is more profitable to sell it as such than to convert it into coke.

The Edgewood Coal Company, the Shamrock Coal Company and the Columbia Coal Company, all present interesting features from the standpoint of the coal man as well as the engineer. Shamrock and Edgewood have long inclines, the former using two, and transferring the coal at the head of the first incline. The Edgewood company works only one seam and uses but one incline, about 3700 ft. long.

The Nicholson Coal Company also uses the double incline, and this company has introduced the only steam locomotive used underground in the district. The use of this steam locomotive is no longer an experiment; it has proved most effective and is the cheapest haulage known.

YELLOW CREEK COAL COMPANY. INCLINE TRESTLE, TIPPLE AND POWER HOUSE

Many Difficulties In Building Railroads

The Sagamore Coal Company and the Stony Fork Coal Company, both on the Stony Fork branch, were opened under difficulties, both in building the railroad tracks and in developing the mines. The operations are reached by two switchbacks from the head of the main line, 10 miles from Middlesboro. The railroad construction for the last few miles cost $75,000 per mile. The tracks are built on the side of the mountain, and the work was all side-cutting. The mountains being steep and the material treacherous, slides were inevitable. One slide or slip was so large that the grade had to be made around it, the slide containing over 100,000 yd. of material.

In the Sagamore mine was encountered a swag, or trough, which is from 10 to 15 ft. deep and from 200 to 300 ft. in width at the bottom. The sides are so steep that the coal lying on these slopes cannot be secured without great cost. This formation runs diagonally across the property and also across the property of the Stony Fork Coal Company which adjoins the Sagamore property. The coal on each side of this immense trough or depression, is practically level and no reason can be assigned for the presence of the swag. The Turner Coal Company after driving in its main entry for 1000 ft. on a sharp decline, went up the hollow a quarter of a mile further and drove another entry which avoided all the dip, but many thousands of dollars had already been spent, which could have been saved.

A Difficult Railway Problem

Three years ago I was confronted by a very difficult problem. At the little station of Ely, 20 miles below Middlesboro, there are three mines, the leases of all adjoining. The mine furthest up the hollow is only one mile from the main line of the Louisville & Nashville Railroad. Owing to disagreements among the operators, each mine is today shipping its coal over its individual track, though one would have been sufficient for all. Although the differences among the three operators were such as to prevent them from uniting to build the track, I held the position of engineer for each.

The location of three tracks in one small hollow was a serious matter, and it finally entailed a large expense. The greatest difficulty was to get over the tracks of the first company with the tracks of the third

company, and this was what had to be done. The crossing had to be made on a sharp angle and over two tracks, so a clear span of 90 ft. would have been required had a steel girder bridge been used, the elevation of one track over the other being 24 feet. The method of making the crossing has probably not been used before because the necessity has probably never occurred. Before reaching the overhead crossing, there was a trestle 600 ft. long and 24 ft. high. Bents were carried up to the track to be crossed, or as near as could be and leave the necessary clearance of 8 ft. from the center of the track. Then there was built a continuous bent on each side of the track, using upright or plumb posts on 4-ft. centers. The sill, mud blocks, plumb posts and the cap along the top were all 12x12 in. pieces, and a cross from one continuous bent to the other was placed on 2-ft. centers. The longest of the stringers was 27 ft. and the shortest was 21 ft. The widest clear span was 23 ft. and the shortest was 16 ft. 3 in. The superstructure of the trestle was carried across on the 9x18 in. stringers just as though they were the caps of bents.

FORK RIDGE COAL AND COKE COMPANY. SLOPE TIPPLE AND STORAGE TRACKS

The structure has been in use for two years and the heaviest engines go over it. The fact that it is on a 3 per cent. grade is also to be considered when its safety is mentioned. The cost of the overhead crossing exclusive of the rest of the trestle was only $750.

These difficulties are always confronting the engineer in the mountainous coal fields for the coal lies where it is not easily accessible, and time, money, perseverance and ingenuity are required to overcome the principal obstacles. Reverse curves and the limits of gradient and curvature are resorted to constantly. Of course a railroad can be built anywhere, but the cost has to be figured down in the case of mine tracks, and while there have been several miles of track constructed in this vicinity which will reach the sum of $75,000 per mile, these are the exceptions and tracks varying in cost from $5000 to $15,000 per mile are the rule.

Coal Mining in Tennessee

By R. A. Shiflett*

The production of coal in Tennessee in 1907 was about 7,000,000 tons, with an increase in value over 1906 of nearly 10 per cent. on the total value of that year. The production of coke will total about 980,000 tons, with an increase in value of 9 per cent. over the total value of 1906.

The coal-mining industry in Tennessee during 1907 has been adversely affected by several conditions: The Southern, and Louisville & Nashville railroads have not been able to handle the output of the plants located along their lines. The mines have not been able to get cars, in fact a number of properties have either been idle or operated short shifts, more than one-half of the time. All the mines in Tennessee working regularly could easily produce 10,000,000 tons of coal if the railroads could handle the output.

The accident on the Louisville & Nashville railroad at Dossett tunnel in Anderson county practically closed down all the mines along the line of the Louisville & Nashville railroad, in Campbell and Anderson counties, for four months, shutting off their Southern trade. The outlook for 1908 is encouraging, and if the demand continues as good as it was for 1907, the production will largely exceed that of the past year. The railroads are making preparations to relieve the car shortage in a great measure and will be in better position to take care of the coal business.

*Chief mine inspector, Nashville, Tenn.

Fatal Accidents

Fatal accidents for 1907 did not exceed 14 inside the mines; this is most gratifying to all concerned, and speaks well for the efficiency of the methods in use. Every precaution is being taken to reduce the number of mine accidents to a minimum, and since the operators in Tennessee are always ready to follow suggestions and obey the laws, the mines are in excellent shape, and much of the responsibility for serious accidents rests upon the miners themselves.

The State department of mines is opposing the reckless use of explosives underground; also the use of inferior oils for illuminating purposes. When the legislature reconvenes, it will be asked to pass new laws prohibiting the use of inferior powders and poor grades of illuminating oil. I am restricting the number of shots in working places and allow the miners to take inside only a sufficient quantity of explosives for actual use each day, as well as restricting the quantity of explosives used in breaking down the coal. The ventilation and physical conditions of the coal mines in the State are good, the fuel produced is of excellent quality and with an increasing market demand, we expect a considerable increase in production during 1908.

The Geological Survey of India has made an interesting report on the coalfields of eastern Bengal and Assam which Consul-General W. H. Michael, of Calcutta, summarizes. The coal lies on the northwestern face of the Eastern Naga hills. The coal measures extend for a distance of about 110 miles, but are exposed only where the river valleys have cut into the deposits. Some of the seams are thick. The best mines, so far developed, have been leased by the Assam Railways and Trading Company, which controls a railroad from the Brahmaputra river to the mines. This company mined 277,000 tons of good coal last year. Coal of varied quality has been discovered in the Garo hills, where the area of the measures is estimated to be about 59 square miles. The coal of the Kashi hills is of a more regular quality. The area of these measures is small; the largest deposit is estimated to contain about 1,200,000 tons of high-grade coal. At present, the coalfields of Assam are lying comparatively untouched and will probably continue so until the widening of civilization creates a demand for the coal, and then some of the greatest coal mines of the Orient will be opened.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

About 100,000 tons of coal are mined in Formosa each year.

During the year ending June 30, 1907, $48,272 worth of Welsh anthracite coal was exported to San Francisco.

Mine doors should be well calked and as nearly air-tight as possible. They should be hung toward the air and should have a face sufficient to enable them to close themselves.

The chief inspector of mines in India states that the average number of miners working underground during the past year was 128,667. This average was made up of males, 83,053; females, 39,583, and children, 6031.

A blunt-pointed pick should be used in mining soft foliated coal, for with a blunt tool better results can be obtained with less work; the blunt point does not sink far into the soft strata, but rather acts as a wedge in separating the coal. For hard, brittle coal, with frequent sulphur balls, a sharp-pointed pick is best.

When about to fire a shot in a gassy mine, inspect the shot; remove all dust and fine coal from the immediate vicinity of the face of the coal; test the place carefully for gas and if the mine is unusually dry and dusty sprinkle with water in the vicinity of the shot. After firing make a careful inspection to see if the gas or coal has been ignited.

While the tamping of dynamite charges is not absolutely necessary, better results are sometimes obtained if the charge is tamped. In preparing a shot: (1) press the cartridge down into the hole with a wooden rammer; (2) press down tightly on the cartridge a small plug of clay and on top of the clay, place sand or gravel pressed down snugly.

In making a mine door for ventilating purposes the construction of the door frame is very important. It should be well set in the roof, ribs and floor. The space between the frame and the ribs should be well packed, preferably with cement, so that there will be no leakage of air. The frame should be so constructed that the door can be hung to open against the current of air.

In tempering a mine pick care should be taken not to draw the temper too high, and thus render the point of the pick too brittle. Avoid burning the point. If the point does not need much sharpening, the shank of the pick should be heated hotter above its point and the heat allowed to draw down into the point after removing the pick from the fire. If a uniform degree of heat is applied to the entire pick, the point will suffer from burning. For ordinary mining, the temper of a pick should be drawn at a deep blue.

An experienced pit boss says that the selection and the kind of wood chosen have much to do with efficiency and economy in the timbering of a mine. For instance, in a wet mine, the best kind of timber to be used is yellow pine, because it contains a large amount of pitch which tends to preserve the timber in the damp mine atmosphere. For a dry mine, hemlock timber gives better results than any other kind of wood, for it is less affected by dry rot, and offers better resistance to the dry mine air than any other wood. Birch should never be used for mine timber; it is easily affected by the mine air, and breaks without warning.

Dynamite is usually known by the percentage of nitro-glycerin which it contains, and is designated 40 per cent., 60 per cent., etc. The simplest and safest way of finding the percentage of nitro-glycerin in an ordinary dynamite cartridge is to extract the nitro-glycerin in the dried and weighed sample with anhydrous ether, then allow the ether in the extract to evaporate spontaneously, and if there is no other substance present that is soluble in the ether, weigh the residue as nitro-glycerin. This weight divided by the weight of the sample taken and the result multipled by 100 will give the required percentage of nitro-glycerin.

Investigation has shown that the diameter of oak timber for mine props should be 1/12 the length of the prop. The best methods of calculating prop strength, position, etc., are found to be as follows: The crushing weight of the prop should be determined from the area of its least cross-section and its crushing strength. The roof pressure per square foot should be determined from the hight of the overreaching stratum. In order to find the correct distance apart at which posts should be placed, center to center, divide the crushing weight of one prop by the roof pressure per square foot, extract the square root of the result, and you will have the distance in feet from center to center of the props, each way.

Investigation has shown that, under ordinary conditions, the volume of the return air is greater than that of the intake. For this reason the sectional area of the upcast should be larger than that of the downcast. The increase in the column of the return air is due to various causes, among them being: 1, The gases, part of which are produced by firing in the workings and are generated as fire damp, etc.; 2, the return air is generally subjected to less pressure than that of the intake, consequently a slight increase is found in the volume of the return air; 3, the temperature of an ordinary coal mine is nearly constant throughout the year and in winter the temperature of the return air is usually higher than that of the intake and it results in an increase of volume at the upcast.

Prop timber should not be injured by the first settlement of the roof, but should reserve its entire strength for supporting loose roof material. This may be accomplished by properly placing the timber, or defeated by improper setting. One method of preservation is to place above the prop a thick block of soft pine into which the end of the prop is forced by the weight of the roof settlement, thus binding it together and preventing splitting; the weight is thus also distributed evenly upon the prop. The same results may be obtained by tapering the end of the prop, although this method is not so effective in preventing splitting as the method previously described. A practical and easy method is to set the post on a foot board, resting on a low mound of culm. This material will yield under roof settlement and thus preserve the timber.

The coalfield of Wei-Hsien in China is remarkable for the irregularities and distribution of its coal seams. Preliminary borings have shown that the whole of the surrounding country has at one time been the scene of violent volcanic eruptions, which so disturbed the coal deposits that it took nearly a year for mining engineers to find a continuous seam. The theory advanced to account for the pockets of coal embedded in the granite, which are discovered, and have been exploited by the Chinese, is that the action of water on the uneven surface of the bed of granite caused deposits of coal forming vegetable matter in the crevices, where it could not be washed away, leaving the upper surface of the granite bare. Since Chinese miners cannot go deeper than 180 ft. on account of their inability to handle the increasing volume of water, it is not known how deep these pockets are. Their lateral area is small. After boring for a year through granite and volcanic tufa, a seam of coal 9 ft. thick was found at a depth of 450 ft. This is a bituminous coal and contains about 30 per cent. ash.

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A Bureau of Mines and the Geological Survey

There will shortly be introduced in Congress a bill for the creation of a Bureau of Mines, a "Mining Service," or something equivalent. This is in response to a demand among many mining men that the mining industry be officially recognized by the Government, that the Government "do something for mining" as it has for agriculture. The Government during 25 years and more has been doing a great deal for the mining industry through the Geological Survey; in fact, the Geological Survey has extended its activities far beyond the limits of its foundation, if the latter be strictly construed, and has become in effect a bureau of mines. However, this does not satisfy the present demand.

There is an essential difference between agriculture and mining, which are held up as the two basic industries with the argument that what the Government has done for agriculture it ought to do for mining. Agriculture is conducted, in general, upon a small individual scale; previous to the entry of the Government into the field there were only sporadic instances of experimenting with new methods; and there was no development of a body of professional men to deal with agricultural problems—even at present there can hardly be said to be such a body. In mining the conditions have been quite the reverse. It has been an industry that has required, and has had, scientific study from the time of Agricola; that has consequently developed a large body of skilled men to give the necessary technical assistance; that is conducted upon such a scale that operators have been able to employ such assistance. The results of this are embodied in one of the richest literatures—records of experience—that any art possesses. Individuals and corporations have all the time tried costly experiments to improve practice, and save in rare instances the additions to knowledge have promptly been made known and an expensively educated, highly trained body of professional men is ready to apply the accumulated knowledge in the interest of any one who is willing to pay a salary or fee representing a comparatively small return upon capitalized professional experience.

Therefore there is no real necessity that the Government should do for mining what it has done for agriculture. The demand for a bureau of mining on this ground is simply a manifestation of the spirit of paternalism, which undeniably is increasing among the people of the United States and will, unless curbed, carry us to ends that even its advocates would recognize as undesirable if they could foresee them. On the other hand the demand for a bureau of mines is worthy on the ground that the mining industry deserves recognition by the Government in view of the fact that the latter is directly concerned in many matters relating to mining; also on the ground that the Government may properly do things in the interest of the whole people, which the people can not do for themselves, although in this particular there is the difficulty that the more important matters of this kind rest with the States and the Federal Government, outside of the territories, can do no more than disseminate knowledge.

The prime considerations in creating a bureau of mines will be to prescribe carefully what it is to do, limiting those things to what such a bureau may properly do and phrasing the law so definitely that later on the bureaucracy will not be able, by crawling through loop-holes or skating on thin ice, to do whatsoever it may desire to do. It is vastly easier to prevent such abuses than to correct them, as the experience with most of the bureaus at Washington has abundantly and amply proved.

Among the things that a bureau of mines may be expected to do are the following:

1. To collect statistics of production, number of men employed, wages, and in general such matters as are covered in the decennial census.

2. To investigate the dangers of mining and study precautionary measures.

3. To investigate and standardize methods of assaying and measurement.

4. To appoint and supervise the inspectors of mines in the Territories; to regulate and supervise the leases of the oil lands of the Indians in Oklahoma.

5. To represent the Government as the lessor in the event that legislation be enacted for the leasing of the reserved coal lands of the Nation.

6. To investigate questions in which the prosecution of the mining industry affects the direct functions and rights of the Federal Government. (Such as hydraulic mining and the control of navigable

streams; damage to forest reserves by smelter smoke).

7. To test material required by the Federal Government for its own use.

8. To supply expert information to the post-office, land office and other Governmental services that may require it in the regular performance of their duties.

It should be no part of the duties of a bureau of mines to (*a*) run free assay offices or (*b*) public experiment stations, or (*c*) to enter the field of metallurgical and manufacturing experiment; because those are things that the people can and ought to do for themselves, and as a matter of fact have been and are doing with the success that our mineral statistics and general prosperity reflect.

It is fundamentally wrong for a Government to enter into competition with its citizens. Desirable as knowledge is, it is no proper function of a Government to disseminate knowledge, simply because it is knowledge. This, however, is the bureaucratic tendency. Once a bureau is established its members, of course with the permission of their chief, engage in the pursuit of non-pertinent investigations and ride all kinds of hobbies at the public expense unless the law be stringent to prevent. The Geological Survey affords illuminating examples of this. Much good work has been done, but also much bad work, and in all cases, it is safe to say, the work that a Government bureau does costs several times what it would if done by private enterprise. The modest and well conducted Canadian Bureau of Mines, which has only a small staff and employs outside experts, is perhaps an exception.

We have remarked previously that much of the work that a bureau of mines can reasonably be expected to do is already being done by the Geological Survey.

Unless there is to be a foolish duplication of work, some of the present functions of the Geological Survey must be shorn off. Its statistical and technological branches should be transferred to the bureau of mines. To secure the maximum efficiency the Geological Survey and the bureau of mines should be under the same head, not merely the Secretary of the Interior, but a scientific, non-political head. The experience in Canada showed how necessary this is. However, we anticipate that the promoters of the bureau of mines measure will not be satisfied with a mere expansion of the Geological Survey, while the latter will oppose the removal of certain of its branches, and both will oppose reporting to any superior less than the Secretary of the Interior. This shows how carefully the bill for a mining bureau must be drawn, and also points out to Congress the desirability of revising the law of the Geological Survey at the same time to insure coördination and harmony.

Incidentally several defects, we should hardly say evils, in the Geological Survey should be corrected. The general work, especially the geological, of this great organization has received our admiration and praise. In its administration it has been clean. We have criticized it for various things, among others for tardiness in its geological investigations of the active mining districts. There has been a great improvement in this respect, but the service is not yet by any means what it should be. Elaborate reports are made of which the value is chiefly historical and many important mining districts remain without any attention whatever. Yet, although the great reputation of the Survey was made through its work in economic geology and that is its particular field—the reason for its being—the attention and time of its experts are allowed to be directed to subjects of no direct geological bearing, in which they have no business to be engaged; and its experts are permitted under leave of absence to engage in private professional work in foreign countries.

The latter is a subject that has excited considerable unfavorable comment. We do not criticize the experts for taking advantage of good private opportunities in what is, so far as we are aware, an entirely legal way. But we do criticize the system of organization which permits the Survey to be deprived of the services of its men when there is so much work waiting to be done in this country, for which they are employed. The members of the Survey should be required to give it their whole time, and they should be forbidden to engage in private professional work at home or abroad. There are other matters which ought to be adjusted, but it is unnecessary to go into them now. The point is that if a bureau of mines is to be created, the law should prescribe its work so that the latter will not become in any way a matter of the whims and wishes of its bureaucracy, and so that it will be properly coördinated with the work of the Geological Survey, while the law of the latter should be revised to confine it to its own sphere of science.

The Anthracite Carriers and the Hepburn Law

Advices from Washington indicate that there will be a concerted effort to induce Congress to modify the terms of the so-called Hepburn law. This law, which will go into effect May 1 next, prohibits any railroad company engaged in interstate commerce from transporting any product in the production or sale of which it is directly interested. While general in its terms, the law was intended to apply especially to coal; and it affects especially the anthracite coal carriers.

The anthracite trade is practically in the hands of eight leading companies, the independent operators being entirely subservient to the large companies. All of them are miners and shippers of coal as well as carriers. Most of them conduct the coal business through the medium of independent companies. In one case—the Philadelphia & Reading—the stocks of the railroad and the coal company alike are vested in a third corporation, which is simply a holding company. In five others the railroad company owns the stock of the coal concern; while two important companies—the Delaware, Lackawanna & Western and the Delaware & Hudson—own and operate their coal properties directly, without even the nominal intervention of a separate organization.

Unless Congress modifies the law or extends the time for its operation—and under present conditions it does not seem likely to take such action—all the anthracite companies will have to cease either mining coal, or transporting it beyond the limits of Pennsylvania after May 1, or they will be subject to the penalties prescribed by the act. So far none of them has taken any steps to divest itself of the ownership of coal properties. This, indeed, would be a difficult matter, for in every case those properties are part of the security pledged for various issues of bonds, and endless legal complications would result.

Naturally, no statement has been made of their intentions; but from the action—or rather inaction—of the companies, it seems altogether probable that they will

resist in the courts the enforcement of the law. This will mean a long litigation; and should the Supreme Court sustain the law, there are questions of old charter rights to be brought in, which will have to be decided as well.

The Production of Copper in 1907

The guesses in the non-technical press as to copper production in the United States in 1907 ranged from 763,000,000 to 860,000,000 lb., which shows how untrustworthy such guesses are. Our report of 895,000,000 lb. (in round numbers) will be found to be close to the final figure, being based, as usual, upon direct returns from the producers, the December production only being estimated, and that by the producers themselves.

The result of 1907 was in all respects normal. For three years we had high prices for copper, the average for electrolytic having been 15.59c. in 1905, 19.278c. in 1906, and 20.004c. in 1907. These high prices had the natural effect of stimulating production. States which had not previously produced any copper to speak of, as for example Missouri and Virginia, turned out considerable quantities in 1907; old mines were reopened in Vermont and new mines were opened in Nevada. The principal mine of the Encampment district in Wyoming, which produced little or nothing in 1906, turned out a considerable quantity in 1907. So it was all along the line. The minor States in general made increased outputs, which in the aggregate amounted to a good deal.

However, the great offset to the heavily reduced production in Montana was the substantial increase in Michigan and the great increase in Utah. It is well recognized now that Utah is going to be one of the great copper producing regions of America. Its progress in 1908 will be uncertain, owing to the closing of all the smelting plants except the Yampa, Murray, and the Garfield, of which only the last has converters. The Yampa matte may possibly be shipped East, but practically the copper production of Utah will be limited by the capacity of the Garfield and the Murray plants. It will be possible for Garfield alone to produce an immense amount of copper, because it will work chiefly on Utah, Boston and Cactus concentrates already high in copper, and in view of these supplies the smelting works is being provided with converter capacity out of all proportion to furnace capacity under normal smelting conditions.

There is no question also that in the statistics for 1908 Nevada will figure as an important producer of copper because the long delayed Steptoe plant cannot very well be procrastinated beyond the coming mid-summer. California also ought to make an increased production of copper in 1908, inasmuch as the Bully Hill works will come into operation, and probably also the Balaklala company will finance itself so that its works, already nearly completed, can be finished.

Michigan and Arizona will probably keep on in the even tenor of their ways. The curtailment of production in the former is insignificant while in the latter it is not so great as commonly estimated. On the other hand many of the minor States feel keenly the effect of the lower price and have had to curtail willy-nilly. At the present time the greatest mystery is as to how the future will develop for Montana.

The Smoke Question at Butte

The report of our Butte correspondent in our issue of Jan. 11 respecting the prospect of a settlement in the smoke litigation between the farmers and the Amalgamated company was erroneous, some interests having apparently given out as news what they hoped would be rather than what was.

As a matter of fact, the Amalgamated company has no intention of compromising this litigation, and never has had any. It is sure as to the merits of its case and is convinced that the decision of the court will be in its favor. The first report of the master-in-chancery was on the whole favorable to the company, and his final report is still more so.

There was also an error in the statement in our news columns last week to the effect that the rates for smelting custom ores at Great Falls had been raised. The smelter there is treating no outside ore except the small quantity of silicious ore required for converter lining and the rates have not been raised.

Transvaal Gold Production

Cabled reports of the December gold output of the Transvaal put the total for the month at 583,526 oz. fine gold, or over 34,000 oz. more than in November. This large increase is probably due to the inclusion in the total for the month of gold obtained from miscellaneous sources and not previously reported, which has been done before in the closing month of the year.

The large December output brings the total production of the Transvaal for 1907 up to $133,350,000, or $4,600,000 more than the preliminary estimate based on the output for eleven months. With this addition the gold production of the world for 1907 shows a small increase over that of 1906, instead of a decrease. The total, however, is still subject to corrections which will be received later from other countries.

THE ARTICLE BY MR. FINLAY, published in this issue, is an illuminating contribution by a mining engineer who is achieving distinction for his careful analysis of mining costs. Mr. Finlay's conclusions as to the cost of producing lead in the Cœur d'Alene are similar to our own, published in the JOURNAL of Jan. 4, 1908. There has been much wild talk as to the extent to which the cost of producing the metals has increased during the last two years. In some cases it has increased; in other cases it has not increased. But in those cases where it has increased, it is probable that such adjustments can be made that the cost of production can be reduced to the figures of six or seven years ago if necessary.

THE AMERICAN IRON trade has never seen so quick and deep a cut in production as in the last two months. In October the pig-iron production was at the rate of 28,500,000 tons a year; in the present month the blast furnaces active are turning out iron at the rate of about 14,000,000 tons a year.

ONE OF THE results of the present depression in business will be a searching investigation into costs of production, with a view to reducing them. The first point of attack will, doubtless, be the labor cost, which is the most apparent and most easily reached. Reductions in wages have already begun, and others will follow.

Metallics

Japan supplies almost one-third of the total iodine demand of the world. The value of the annual output amounts to about $500,000, and is largely marketed in London.

In mines filled in with sand tailings the danger of the sand getting on the move and spreading to places where it is not wanted, below its own level, must be kept in mind.

The Royal Commissioner on Mines has decided to have an investigation made to determine whether there are in the British coal mines any indications of ankylostomiasis, or miners' worm disease.

In New Zealand dredges are required to be surrounded with a life-line, or loop-line, as it is called there, when working in open water. This life-line saves many from drowning when the current is swift.

It has been suggested that, at deep mines operated through only one shaft, such as the deep-deep mines on the Rand, the shaft should be "timbered" with iron so as to avoid the danger of fire in the shaft itself.

In Western Australia fresh unwashed cyanide tailings were formerly used for mine filling. However, the action of acid mine water on the cyanide evolved noxious prussic acid and made it necessary to wash the tailings before utilizing them as filling.

The oxidation of metals in the foundry has been diminished by keeping the molten metal surrounded as much as possible by reducing gases, both while melting and while pouring. The pernicious effect of the iron stirrer for mixing alloys has been demonstrated, and one of graphite has been substituted.

In determining the calorific power of coal in combustion bombs by use of sodium peroxide, incomplete combustion has often to be contended with. Other chemical substances are often added as accelerators. Some of those suitable for this purpose are barium peroxide, niter, and potassium persulphate.

A novel feature at the Victoria mill, Waikino, New Zealand, is that the machinery is run by gas engines driven by gas from gas-producers, thus enabling a cheap lignite to be used for fuel. Many mines in the United States west of the Rocky Mountains might well consider this means of using near-by lignites for fuel.

A shaft fire is one of the greatest dangers at mines opened by only one shaft. When the shaft is dry (also in the pipe compartment of wet shafts where steam is used underground) water should be allowed to trickle down the timbers. This will prolong the life of the timbers by keeping them constantly moist and also removes the danger of fire in the shaft itself.

Not all graphite, however fine, is suitable for use in pencils; a high-quality flake graphite would yield a "lead" that would slip over paper without leaving more than a faint streak. Fortunately those peculiar characteristics, which render certain varieties of graphite unfit for use in pencils, are the qualities most sought for in raw materials to be used for making crucibles.

After steel rails come from the rolls they generally warp while cooling and whatever crookedness exists must be taken out by cold straightening. The usual form of press for this purpose is a slow-motion plunger press, the pressure being applied to the rail centrally between bearings 42 in. apart. The strain and torture to rails during cold straightening is one of the severe and objectionable parts of the process of rail-making.

It has been found that large magnets for handling pig and scrap iron are best made with concave pole-pieces, as larger numbers of irregular shapes are handled at smaller effort than when the face is flat. When concave-faced magnets are called upon to lift large heavy pieces having flat faces, the intervening air gap is objectionable and an auxiliary pole-piece, so designed as to extend the inner pole-shoe down to the level of the outer shoe, is bolted into place.

The A-drift set is now being used in some of the drifts at the Waihi mine. This method of timbering has little to recommend it—a fact which accounts for its use being confined almost entirely to Australia. In the first place it causes practically all the pressure on the timber to be a cross stress instead of, as is desired, a longitudinal stress; this A-set also reduces the head-room and unduly increases the bottom room. The top joint is liable to ride unless the two legs are bolted together.

At the plant of the Bethlehem Steel Company a revolving car-dump, similar to those used at some coal and metal mines, is in use for unloading railroad cars. The device may be described as a skeleton cylinder large enough to admit two standard gondola cars which are run into the cylinder and are clamped and stayed by adjustable screws operated by individual motors. When the cars are fastened the whole apparatus is revolved until the cars are tilted upside down, allowing the ore to fall out through the skeleton framework.

A detachable bit for drill steel is being introduced in some English mines. When detachable bits are used, the drill runner has only the bits to carry back and forth. The average weight of the Anderson type of bit is 6¾ oz. In a test of these bits a machine operating at 70-lb. air pressure drilled a hole 5 ft. 3 in. long in 19 min. 10 sec. and tapering from 2¼ in. to 1 11/16 in. The first change of bits required 55 sec., the second change took 1 min. 25 sec. and the third change 2 min. 10 sec., the increased time being necessary to change the shank so that the drill itself would not have to be moved. The net rate of cutting was 2.8 ft. per min.

Many ways of decreasing the injurious defects of dust on miners have been tried. In these methods either the dust is allayed by spraying or the dust is prevented from entering the lungs of the miners. To the water spray miners often object because of the difficulty at many dry mines of getting water for the supply-tank.. To the respirators the miners object mainly because it hampers conversation with a nearby partner. At the St. John del Rey mine, Brazil, helmets supplied with air from the compressed-air pipe are worn by the machine men. The small rubber pipe, which brings the air to the helmet, can be detached instantly by means of a connection, the valve in which closes automatically when detached. Expansion cools the air and renders work in a hot stope much pleasanter.

Commercial lifting magnets are beginning to find more extended use in steel plants, foundries, shipyards and like places. These devices are suitable for handling pig and scrap iron, particularly when in rough form and allow much saving in time since there is no need of fastening the material to be lifted to the crane or of loading it into a bucket. In foundries and rolling mills the products may be handled long before they could be touched by hand on account of the heat retained. The lifting capacity of magnetic cranes depends largely on the nature of the material to be carried. With fair magnetic contact a 50-in. magnet of the Cutler-Hammer type is said to lift about 20,000 lb., while with unfavorable contact conditions and shape of material to be transported, the available magnetic flux may cause the load limit to drop to 1000 lb. or less.

Detachable drill-bits have been tried on the Rand, but they have not proved very satisfactory. It is to be hoped that a successful detachable drill-bit will be invented as it would greatly aid in reducing drilling costs. Plenty of sharp steel is necessary for efficient drilling. Many miners, through laziness, use steel after it has become much too dull for efficient work. Underground forges are used at some mines, notably the Homestake in the Black Hills, and thus the labor of carrying the steel back and forth from the stopes is diminished. Underground electric forges are being tried on the Rand for the same purpose. But a practical detachable drill-bit would very simply solve this problem. Besides by decreasing the amount of money tied up in drill steel and the cost of handling it, this would cause mining companies to furnish plenty of sharp steel to the miners.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Negative Results in Pyritic Smelting

In the JOURNAL of Nov. 30, R. R. Moore runs the harrow over me, so please listen to the "toad."

I have found the gases from a hot furnace top to average about 400 deg. C., and we could recover about half this heat in the blast. I think all these heat calculations are grand and useful as far as they go, but to my mind the chemical reactions at high temperatures are of vastly greater importance.

The true reason for a hot furnace top is, in my idea, not so much to heat the blast, as to enable me to see what I am doing, as in an open-hearth steel-melting furnace, which is my *beau ideal* of visible high-temperature smelting. Working with a cold top is blind work.

If the charge only heated itself and no chemical changes took place, other than those we figure on, we could sleep peacefully; but freeze-ups, those best of furnace educators, teach us that unexpected and unexplained chemical combinations take place during the descent, and by the time the charge is in the hot working zone, it is in anything but the right condition. This is why I prefer a hot top and charging as nearly continuous as possible, so as to keep the chemical and physical conditions as similar as possible. Mr. Moore omits from his calculations the coke saved by the warm blast, so that the final caloric balance-sheet, after taking in everything, will not be so bad.

CLEAN SLAGS AND HOT BLAST

As to copper in the slags: I have run mattes from 1 to more than 50 per cent. copper, with only a trace of copper in the slag. Of course, this was with warm blast, for I never could do it with cold blast owing to lack of heat at the tuyeres. The lime was less than 10 per cent. Unless lime carries values it is poor smelting to use more than 10 per cent., just as it is poor smelting to use more than 10 per cent. coke in copper matting. Put in a blast heater and save coke and lime, and get in more ore.

If 0.3 per cent. copper in the slag be clean smelting when ores only average about 2 to 3 per cent. copper at the mine, the outlook is foggy; but I hope for better things. It appears to me to be merely a question of heat at the tuyeres; and knowing how we control very small amounts of chemical elements in our steel, and the effect temperature has on that control, I feel sure of improvement. When the copper man begins to think as the steel man does, that 0.05 per cent. is a "whole lot," there will be kinetic energy developed in the right line.

I remember the old cold-blast iron furnaces and the slags they made. Contrast them with the hot-blast work of today. Thus it will be with copper. The late Sir Wm. Siemens, 30 years ago, often spoke of bessemerizing copper and smelting the ores with hot blast, and I have seen so many of his prophecies come true, that I firmly believe cold-blast smelting for copper will soon be as rare as for iron.

As to the last paragraph: I entirely disagree with the statement, that "1150 deg. C. is a long way from red hot through and through." My experiments and observations on a large scale have shown me that a mineral substance such as quartz will be red hot through and through at less than two-thirds of that temperature. Has Mr. Moore ever worked an acid open-hearth steel-melting furnace? By this I mean, heated it up, put in the bottom, worked off the charges, cooled it down and repaired it. Operating an open-hearth furnace is an education in high temperatures, the behavior of silica, etc., under various chemical and physical conditions.

WALTER E. KOCH.

El Paso, Texas, Dec. 24, 1907.

The United Mining Company—A Warning

This concern, dating its circulars and letters from 100 Broadway, professes to own, and proposes to operate, the following mining properties:

1. The Keystone and Holy Terror, in the Black Hills of South Dakota.
2. The Greene-Campbell mines, near Silver Star, Madison Co., Mont.
3. The Azteca copper mines, 10 m. from Alamos, Sonora, Mex.
4. The Navaho gold-mines, Sandoval county, N. M.
5. The Century copper-mine, Brownell, Pima county, Ariz
6. The Buckeye gold-mines, in Flathead county, Mont.
7. The Oldham-Stirling gold property 25 m. from Halifax, N. S.
8. The Maconi mines, in the state of Queretaro, Mex.
9. The Caribou Consolidated gold-mines, in Halifax county, Nova Scotia.

The prospectus declares "the total value of ore in ground now blocked out" in these properties to be $26,280,500, and the "estimated annual dividends, when fully developed and operating," to be $8,962,000, "equivalent to more than 100 per cent. on entire capital stock;" and this statement follows a series of accounts of the several properties, at the head of which stands a list of "the engineers whose figures are incorporated below," beginning with the name of "Prof. Rossiter W. Raymond, C.E., E.E., E.M." This use of my name, accompanied with a lot of titles which do not belong to me, is open to more serious criticism, because entirely unauthorized and misleading, as the following explanation will show:

In 1871, I visited, as U. S. Commissioner of Mining Statistics, the Green-Campbell gold mine, No. 2 in the above list; and in my official report, published in 1872, I devoted one page to a description of the mine, with a diagram, exhibiting its condition at that time. Now, I have frequently had occasion to say: (1) that, in preparing my annual octavo on mining statistics, I was neither authorized nor physically able to make such rigorous professional examinations and estimates of individual mines as an engineer makes, upon the challenge of vendors, for the guidance of his clients, who are contemplating purchase—in fact, that the overwhelming majority of the descriptions contained in my reports were avowedly based upon the data furnished by correspondents; and (2) that even the most careful and responsible opinions uttered by me or any other mining engineer, can have, after the lapse of many (in this instance, 36) years, nothing more than a historic value. When honest people wish to use, in aid of honest enterprises, any passages contained in my official reports of the last century, they either apply to me for a further opinion, or else make, in such a way that it cannot be misunderstood, their quotation from the public documents concerned.

In this case, however, I need hardly repeat such cautions. What I wrote in 1871 about the Green-Campbell mine showed: that the average width of the pay-ore had been, up to date, about 8 ft.; that the average yield had been $17 (the highest being $30) per ton; and that the ore-body had been practically exhausted to the lowest level then opened, with the exception of a block of ground, measur-

ing about 100 ft. in length by 60 in hight, in which the pay-streak was from 5 to 7 ft. wide—being smaller than the average in that portion of the ore-body already worked out. This would give total reserves of, say, 3000 tons, yielding (if equal to the previous average) $51,000 gross, as the result of something like six months' steady running of the stamp-mill. The cost of mining, hauling by wagon 2.5 miles to the mill, crushing and amalgamation, shipping and sale of bullion, together with general expenses, would have to be deducted from the yield of $51,000. It is not surprising, therefore that, in my description of 1871, I said it was necessary to extend the workings to a lower level, and that it was proposed to do this by means of a combined vertical shaft and incline.

This statement of mine is the company's sole warrant for the use of my name. I never saw any of its other properties. This one appears in the company's prospectus as "the Greene-Campbell mines," and the additional "e" and "s" seem to cover a multitude of new resources; for the "mines" are declared to possess an "available supply" of 50,000 tons of a 7-ft. vein, averaging $30 per ton, 1000 tons of a 12-in. vein, averaging $132: and 3500 tons on the dump averaging $7—a total of $1,656,500, besides future supplies, guaranteed by present developments, yielding profits of $200,000 for years to come.

Whatever may be true in these assertions was not stated or prophesied by me 36 years ago; and the adroit use of my name in indirect support of them is not frank and fair, even if it has been made without fraudulent intent.

Unwilling to discourage any legitimate mining undertaking, however speculative, I have made some further inquiry as to this one; and I have discovered enough to warrant me in advising all persons who may be urged to invest in its stock to investigate it thoroughly in the manner suggested below, before risking their money in it:

1. This company professes to own certain mining properties. Find out which of these properties it actually owns; which of them it has a disputed claim to own; and which of them it only intends to acquire, under an option; and, in any case of the latter kind, whether, and for how long, the option is acknowledged by the other party to be still valid.

2. The officers of this company are circulating alleged copies of extracts from letters written by engineers and other people of high standing, either indorsing them as individuals, or pronouncing a favorable opinion upon their scheme. These extracts are reproduced without date. Write to a few of these eminent persons, and find out when and under what circumstances they gave the favorable opinions which are now thus circulated; whether their said opinions referred to the present phase of this enterprise, or to a former phase, in which it received the support of many reputable persons who have since withdrawn from it; whether their former opinions are correctly quoted in the circulars of the company; and whether it is with their consent, or against their protest, that these former opinions are now used to promote the selling of the company's "common" stock.

All these inquiries it is the business of a sane investor to make for himself. My duty in the matter has been sufficiently performed when I have exposed and rebuked the improper use of my own name. Nevertheless, if the promoters of this scheme should feel themselves aggrieved by any statement I have made, I shall be perfectly ready to receive their protest, and to publish it, with such further remarks as may be required, either to express my sincere apology, or to make known more fully the grounds of my present unfavorable judgment.

Without pronouncing, at this time, any definite opinion as to the good faith of the promoters of this scheme, I do not hesitate to say that, if they are acting in innocent sincerity, they are to be severely blamed for imitating so closely the style and the methods of designing adventurers.

R. W. RAYMOND.

New York, Dec. 23, 1907.

Mechanical Efficiency of Tube Mills

A recent number of the JOURNAL contained an advertisement of a certain tube mill purporting to show by an elaborate array of figures that less power is required to run this mill because the load is supported on driving wheels placed centrally beneath, instead of on gudgeons at the ends of the tube. The figures are based on the assumption that part of the load of pebbles, etc., balances another part in this mill, but not in the other styles.

Now, if anyone will tell me what difference it makes in this balancing of the load, whether the tube is supported on driving wheels beneath, or on gudgeons at the ends, I shall be much obliged. It seems to me that the work done on the load is the same, and any difference in power required must be due to difference in friction of the driving or supporting parts.

We may look at the matter in the following way. It is the friction between tube and charge that keeps lifting the pebbles around in the mill, and the force exerted by this friction at the outer edge of the charge is just that necessary to keep the charge in equilibrium, that is, to keep its center of gravity in the same place. It makes no difference how the individual pebbles move around. The force tending to make the charge slide around to a level position is its weight W multiplied by the horizontal distance d from its center of gravity to the center of the mill. If r is the radius of the mill, the force required at the circumference to maintain equilibrium is $\frac{W d}{r}$ and the rate of doing work on the charge is this quantity multiplied by the peripheral speed of the mill, regardless of exterior conditions of support and friction.

E. E. WHITE.

Ispheming, Mich., Dec. 10, 1907.

I will try to give an explanation of the matter in question by what we may call the "rule of thumb." Supposing Mr. White should try by hand to revolve a tube mill journaled on gudgeons and filled with the proper charge of pebbles and materials; and after this experiment should take the tube mill out of the bearings, and place it on two rails, which would be equivalent to the tires that we use on our tube mills; and then roll this tube mill along the rails. I am sure that he would then be able to understand why the system of driving a tube mill resting on wheels requires less power than a tube mill journaled on gudgeons. R. F. ABBE.

New York, Dec. 20, 1907.

The First Coal Shaft in Indiana

In the JOURNAL of Dec. 14, in mining notes from Indiana, appeared a statement that the first coal shaft in Indiana was sunk in Clay county in 1854. This shaft has, of course, long been abandoned.

In this connection, however, it may be of interest to know that there is a coal shaft in Evansville, on the banks of the Ohio, which was sunk in 1855, and from which coal is still being hoisted. This mine, the old Ingleside mine, has been in operation nearly all the time since it was first opened. The shaft is 265 ft. deep, is as good as ever, and a plumb line shows it to be quite as straight and true as most of those put down at present.

The mine is still in the family of the descendants of the owner of the land on which it stands. It is at present producing about 200 tons per day, and for the past 15 years it has been running practically every day, as the Louisville & Nashville Railway engines coal at the mine.

It may be of further interest to note that the original royalty paid the owner of the land by the operator was 0.5c. per bushel of 70 lb., which figures about 14c. per ton. This might seem a little excessive now. DAVID INGLE, JR.

Oakland City, Ind., Dec. 24, 1907.

A company called "Hauts Fourneaux et Aciéries du Chile" has acquired extensive rights and concessions in iron and coal lands in Chile and proposes to begin the manufacture of iron and steel in the near future.

New Developments in the Goldfield Strike

The report of Messrs. Murray, Neill and Smith, the commissioners appointed by President Roosevelt last month to investigate strike conditions in Nevada, was made public Jan. 12. The commissioners make little or no criticism of the Western Federation of Labor, but are rather severe on the mine owners and the Governor of Nevada. In making public the report President Roosevelt gives a copy of his latest letter to Governor Sparks, which bears the date Jan. 4 and is as follows:

"SIR: I have received the copy of your proclamation, dated December 30, 1907, summoning the Legislature. As I have notified you, the troops will stay for three weeks from the date of this call, so that the Legislature can meet and opportunity be given the State authorities to take efficient action for the preservation of the public peace in the exercise of the police powers of the State. I call your especial attention to the telegram sent to you on December 14 by the Secretary of State. This sets out what must be shown as a matter of actual fact to exist in order to warrant the President in acting on the request of the State authorities. The action must be either to suppress an insurrection which the State authorities are unable to suppress or to secure to some portion or class of the people of the State the equal protection of the laws to which they are entitled under the Constitution of the United States and which is denied them.

"Action under this or any other section requires the production of evidence sufficient to sustain a judgment by the President that the condition described in the statute exists. A mere statement of domestic disturbance, still less a mere statement of apprehension of domestic disturbance, is not sufficient, even though it comes from as high and unimpeachable a source as the Governor of a State. Such a communication from the Governor or from the Legislature warrants the President in taking immediate steps to put himself in readiness to act, in view of the probability of occasions arising which will require his action. I accordingly sent the troops to Nevada on your request, and I have now directed that they be kept there pending the assembling of the Legislature.

"Meanwhile I sent out Assistant Secretary of Commerce and Labor Lawrence O. Murray, Commissioner of Corporations Herbert Knox Smith and Commissioner of Labor Charles P. Neill to investigate and report to me the actual conditions of affairs in Goldfield. I have just received a report from these three gentlemen, which sets forth in the most emphatic language their belief, after a careful investigation on the ground, that there was no warrant whatever for calling upon the President for troops and that the troops should not be kept indefinitely at Goldfield. The report further states that there was no insurrection against the power of the State at the time the troops were called for, that nobody supposed there was such an insurrection, and that none of the conditions described in Sections 5297-8-9 of the Revised Statutes as warranting interference by the Federal Government existed, and that the effort was and is plainly an effort by the State of Nevada to secure the performance by the United States of the ordinary police duties which should as a matter of course be performed by Nevada herself. The report further says:

"There is absolutely no question that if the State of Nevada and the county of Esmeralda exercise the powers at their disposal they can maintain satisfactory order in Goldfield; that so far those authorities have done nothing, but are relying upon Federal aid, and their attitude now is that of expressly refusing to do anything and desiring to throw their own burdens upon the Federal Government for the maintenance of those elementary conditions of order for which they, and they anly, are responsible.

"The signers of the report express their conviction that the troops should remain in Nevada until the assembling of the Legislature, so as to preserve the *status quo* in order that the Legislature may deal with the situation as it exists, but that shortly thereafter the troops should be removed.

"I agree with the recommendation of this report, of which I enclose a copy, and shall act accordingly. Unless it can be shown that the statements of the report are not in accordance with the facts it will be incumbent upon the Legislature of Nevada, when it convenes, itself to provide for enforcing the laws of the State. The State of Nevada must itself make a resolute effort in good faith to perform the police duties incident to the existence of a State."

Sincerely yours,
THEODORE ROOSEVELT.

The commissioners in their report profess to be satisfied that the troops were called for by the operators in order that they might carry out their plan of reducing wages and refusing to recognize the miners' unions. By refusing to recognize the union by an agreement among themselves, the commission says, the mine owners violated a law of the State of Nevada. The report adds:

"There has existed at Goldfield, which is exclusively a mining town of an estimated population of between 15,000 and 20,000 in southern Nevada, for over a year past, and especially since the spring of 1907, a disturbed industrial situation, due to frequently recurring labor difficulties between the mine operators on the one hand and the miners on the other. The two sides were represented almost completely by the Goldfield Mine Operators' Association, including almost all the owners, operators or lessees of mines on the one hand, and by the local unions of the Western Federation of Miners on the other, a union comprising substantially all the miners in Goldfield. This union, known as Goldfield Miners' Union No. 220, is a branch of the general organization known as the Western Federation of Miners. * * * This acute situation disappeared before the end of the spring of 1907.

"On November 27, 1907, a strike of the miners was inaugurated and is still in effect. This strike grew out of a refusal on the part of the miners to accept cashiers' checks in payment of their wages. The miners insisted upon some form of guarantee by the mine operators of whatever paper was accepted in lieu of cash. Various propositions were made, but no basis of agreement was reached.

"The mine operators insist that the attitude of the miners in refusing to accept cashiers' checks in payment of wages in the then acute currency condition of the country was unjustifiable, and that this as a culmination to their past experience exhausted their patience and definitely determined them to make a final break with the Western Federation of Miners and establish their permanent independence of the organization.

"The action of the mine operators warrants the belief that they had determined upon a reduction in wages and the refusal of employment to members of the Western Federation of Miners, but that they feared to take this course of action unless they had the protection of Federal troops, and that they accordingly laid a plan to secure such troops and then put their program into effect."

According to *L'Echo des Mines* a law has been passed in Spain, in virtue of which a commission of agents of the minister of finance will be charged with the duty of determining and publishing, each year, the total value of all minerals extracted, to the end that they may be taxed 3 per cent. The government also contemplates presenting a law to the national assembly allowing the forcible expropriation of mining property.

It has become the fashion to speak of the French investor as an ultra-conservative person who will run no risk. M. Leroy-Beaulieu made this comment to a correspondent of the New York *Evening Post*, when asked if that was true: "Quite the contrary. We built the Suez canal and lost our money in Panama; we hold the Spanish exterior debt, and we have built the Spanish railways; and we are at least half-owners with England of Rio Tinto copper. All this meant risk. No, we are not over-prudent; and if we have money today, while others have not, it is because we are a naturally saving people."

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Quincy A. Shaw, Jr., of Boston, has been visiting the Lake Superior copper region.

Beginning Jan. 1, 1908, C. L. Rameau is general manager of the West Canadian Collieries, Ltd., with head office at Blairmore, Alberta, Canada.

Edwin Higgins, recently of Butte, Mont., and Claude T. Rice, recently of San Francisco, Cal., have joined the editorial staff of the JOURNAL.

William E. Woolfe has been appointed superintendent of the Davis coal mine at Flemington, W. Va. He has had long experience in coal-mine work.

James Fleming, a member of the miners examining board, and assistant foreman at the Excelsior colliery, has been appointed foreman at the Corbin colliery, Hazleton, Penn.

Benjamin Th. Loeb has resigned his position as metallurgist to the Reforma Mining and Milling Company, at Campo Morado, Mexico, and will open an office in the City of Mexico.

V. L. Wills has resigned his position at Ensley, Ala., as assistant general superintendent of the steel plant division of the Tennessee Coal, Iron and Railroad Company, to locate in Chicago with the Inland Steel Company.

L. M. Bowers has been elected vice-president of the Colorado Fuel & Iron Company. Mr. Bowers was recently added to the directorate of the company, succeeding Col. R. C. Clowry, and represents the Rockefeller interests of the company.

Professor Robert H. Richards is approaching the completion of his additional volume on "Ore Dressing," and has four assistants, and part of the time two stenographers at work upon it. He hopes to go to press in the late spring or early summer.

Robert T. Hill, mining geologist, of New York, has become vice-president and director of the technical department of the Hill Syndicate, which has recently been organized for the purpose of conducting a general mining business. The company has offices at 25 Broad street, New York. F. W. Graves is president and C. L. Graves general manager.

Myron H. Lewis and Clifford B. Moore have opened offices in the St. James building, 1133 Broadway, New York, where they will conduct a general consulting engineering business in waterproofing, foundations, hydraulics and re-inforced concrete. Special attention will be given to making investigations, reports and tests and to the preparation of plans, estimates and specifications.

George L. Collard, of Birmingham, Ala., has resigned his position as general superintendent of blast furnaces for the Tennessee Coal, Iron and Railroad Company to accept a similar position with W. J. Snyder & Co., of Pittsburg, Penn. The position vacated by Mr. Collard has been divided, Frank Williams being appointed general superintendent of the six Ensley furnaces and James T. Gibson general superintendent of the furnaces located at Birmingham, Bessemer and Oxinoor.

J. H. Granbery, formerly supervising engineer (on the staff of J. G. White & Co.) of the naval coaling station, Olongapo, P. I., has been engaged as engineer by the firm of Buell & Mitchell, steel contractors and experts, 120 Liberty street, New York,; this firm is now taking up the designing and construction of complete plants for special processes and for the economical handling and storage of material in large quantities, lines in which Mr. Granbery has specialized for many years past.

Obituary

R. M. Johnson, prominent in Utah mining circles, died in Salt Lake City, Jan. 7. He owned considerable mining property at Gold Springs and Stateline, Utah.

Edward C. Hanna died at Philadelphia, Dec. 27, in his 85th year. Entering the service of the Pennsylvania Railroad in early life he rose from place to place until on Jan. 1, 1870, he was made superintendent of the Short Mountain colliery, at Lykens, Penn. Just before retiring to private life in 1883, he installed the first electric haulage plant in the drift workings of that colliery, which continues in operation at the present time.

Mine Inspector James Martin, of Plains, Penn., died last week, aged 56 years. He attained some undesirable notoriety in September, 1897, when as sheriff of Luzerne county, he led a posse which fired upon a mob at the Lattimer colliery, a score or so of the foreigners being killed. The sheriff and his posse were on trial for six weeks and all the defendants were acquitted. It is said that Martin recently declared that he did not give the order to fire upon the foreigners. The case caused great excitement in the anthracite region at the time.

Robert B. Brown, aged 61 years, died Jan. 2 at his home in Pittsburg, Penn., from heart failure resulting from a slight attack of pneumonia. Mr. Brown was educated at the Western University of Pennsylvania, and at the Sheffield Scientific School of Yale University. He was interested in numerous enterprises, principal among which was the supplying of natural gas to Pittsburg. He was organizer of the Duquesne Steel Company, along with Joshua Rhodes, W. G. and D. E. Park, and built the most modern mill of its day at Munhall, Penn., which was later absorbed by the Carnegie Steel Company.

L. H. Wheeler, superintendent of construction at the Garfield, Utah, mill of the Boston Consolidated Mining Company, was accidentally killed by the bursting of a steam pipe in the plant on Jan. 6. The mill was just about to be placed in commission. Interment took place in Salt Lake City. He left a wife and one child. Mr. Wheeler was a comparatively young man. Before going to the Garfield mill, he was superintendent of the machine shops of the F. M. Davis Iron Works Company, at Denver, Colo. He was an able mechanical engineer, and will be mourned by many friends, who appreciated his estimable qualities.

Isaac Reese, a pioneer iron manufacturer and more recently identified with the fire-brick industry, died Jan. 1 at his home in Pittsburg. Mr. Reese was 87 years of age. He came with his parents to this country from Wales in 1832, and after the family had settled at Pittsburg, William Reese, the father, became one of the best known iron men in that city during the middle of the last century. His sons, Isaac and Jacob, became associated with him and attained prominence in the building of blast furnaces. Later Isaac Reese took up the manufacture of fire brick and his sons were interested with him in the firm of Isaac Reese & Sons. Plants were established at Osceola Mills, Manorville, and near Kittanning, Penn. When the consolidation of various fire brick interests was effected several years ago, Mr. Reese retired from active business life.

Societies and Technical Schools

Wisconsin Mining School—The new Mining Trade School at Platteville, Wis., will be opened on Monday, Jan. 27. This school was founded by the Wisconsin legislature of 1907 to meet the need for secondary mining education. The course offers inducements to the older working miner, as well as the young man, to take advantage of its educational opportunities. The entrance requirements are a grammar school diploma, or its equivalent in arithmetic, and the use of the English language. Tuition is free and the necessary expense of a school year is calculated at $170. The course embraces two years of school work and two summer periods of practical mining work. One summer's work will be spent in the metal mines of the southwest Wisconsin lead and zinc district, and the other in the coalfields of northern Illinois, which lie only a few miles southeast of Platteville. It will be the aim of the school not to develop consulting engineers, but rather the executive man of action in a mining occupation. R. B. Brinsmade, of Salt Lake City,

formerly professor of mining and metallurgy of the New Mexico Mining School, at Socorro, is director of the new school.

Western Association of Technical Chemists and Metallurgists—The third general meeting was held at Deadwood, S. Dak., Jan. 2-4, inclusive.

Among the important features of the business of the meeting was the question of the form in which to continue the publication of all papers read before the society. It has been the practice of the association to have its papers read, discussed and published all in strictly technical style, but some of the members favor the publication in an elucidated form to enable the average millman and non-technical employee to understand and appreciate their merit. No action was taken, as it will be decided by the board of control.

Two new members were chosen on the board of control, one of the three whose term had expired, W. F. R. Mills, of Denver, Colo., being re-elected, while Charles H. Fulton, president of the South Dakota School of Mines at Rapid City, S. Dak., and J. M. Callow, of Salt Lake, were selected to fill the other vacancies. President W. G. Swart will be the unanimous choice of the board of control for re-election.

A feature of the convention was the establishment of a South Dakota section, making four in all. L. D. Mills was made chairman, George A. Nichols, treasurer, and Ivan E. Goodner, of Rapid City, secretary. The section will hold meetings every two months in Deadwood. Its executive committee consists of C. H. Fulton, M. F. Coolbaugh, both of Rapid City, and J. V. N. Dorr, of Lead. C. W. Merrill, of Lead, was chosen as sectional representative on the national board of control, which will meet in Denver next week to choose new officers. El Paso, Tex., will probably get the next convention.

The papers read were as follows: "Assay Scheme for Cyanide Solution," by Willett Barton, of Millers, Nev.; "A New and Short Method for the Determination of Tungstic Acid in Wolframite Ores," by J. B. Ekeley, of Denver; "Calorific Value of Coal as Determined by Mahler Bomb Calorimeter," G. A. Burrell, of Denver; "Conical Tube Mill" (illustrated with model), by H. W. Hardinge, of Colorado Springs; "Cyanide Cleanup at the Portland Mill," J. M. Tippett, of Colorado Springs.

Industrial

The Queen gold mine at Salmo, B. C., owned by Wm. Waldie, of Nelson, B. C., is to be supplied with an air compressor and drills made by the Canadian Rand Company.

Herman Nieter has opened an office at No. 2 Rector street, New York, as eastern agent for the Braddock Machine and Manufacturing Company, of Braddock, Penn., and the Canton Boiler and Engineering Works, of Canton, Ohio.

The hydro-electric plant at Trinity River, Cal., is constructed with an an eye to the future rather than the present needs of the community which it serves. It is located in the center part of Trinity county, Cal., two miles below the town of Junction City, where Cañon creek, from which the water used for power is obtained, flows into the Trinity river, having a drainage area of 52 square miles. The dam, which is small, serves merely for diverting the water. Alternating sections of ditch and open flumes, with a total length of 5250 ft. and a tunnel 1820 ft. long are comprised in the system. An effective head of 600 ft., or working pressure of 260 lb. per square inch, is obtained from two penstocks, each 1165 ft. long. The powerhouse is equipped with Allis-Chalmers electrical machinery, consisting of two three-phase, 25-cycle generators; each 750 kw., 500 r.p.m., 2200 volts; seven step-up transformers and auxiliary apparatus. A description of the entire plant is given in a recent Allis-Chalmers bulletin.

The New Jersey Zinc Company has recently placed contracts for two 22x48-in. Allis-Chalmers duplex direct-acting Corliss hoisting engines, with double drums, to be installed at Franklin Junction, N. J. The engines are each equipped with non-releasing Corliss valve gear and drive two drums each 10 ft. in diameter by 5 ft. 5⅝ in. face. These units will handle a total load of 19,562 lb. up an incline of 47½ deg. from the horizontal, from a vertical depth of 1050 ft., with steam pressure at 140 lb. per square inch. The load is made up as follows: Ore, 10,000 lb.; skip, 6000; 1425 ft. of 1¼-in. rope, 3562 lb. The engines are fitted with parallel motion post brakes set by weight released by steam, and Stephenson link motion reversing gear, with one drum keyed to the shaft and the other driven by improved lane friction clutch. All the above mechanism is operated by auxiliary steam engines, with oil-controlling cataract cylinders above, operated from the engineer's platform by means of improved floating lever devices, except in the case of the clutch engine which will have a positive motion up or down

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

R. D. Wood & Co., Philadelphia, Penn. Suction Gas Power Plants. Pp. 12, illustrated, paper, 8½x11¼ in.; December, 1907.

Scully Steel and Iron Company, Chicago, Ill. Stock List. Pp. 144, indexed, illustrated, paper, 4½x7 in.; January and February, 1908.

Lead Lined Iron Pipe Company, Wakefield, Mass. Lead and Tin Lined Iron Pipe and Fittings. Pp. 20, illustrated, paper, 4x6¼ in.

Chalmers & Williams, Chicago, Ill. Gold and Silver Mill Machinery. Catalog No. 1—Sections B, C, D, E and F. Illustrated, paper, 7x9 in.

A. Leschen & Sons Rope Company, 920-932 North First Street, St. Louis, Mo. Half a Century of Rope Making. Pp. 88, indexed, illustrated, paper, 8x10¼ in.; 1907.

Knowles Steam Pump Works, 114-118 Liberty Street, New York. General Catalog K-800. Knowles Pumping Machinery. Pp. 174, indexed, illustrated, paper, 6x9 in.

The Mine and Smelter Supply Company, Salt Lake City, Utah. M. & S. S. Co.'s New Type Balance No. 1000. Manufactured by Heusser Brothers. Folder and Insert, illustrated, paper, 3¼x6 in.

Construction News

Muhlenburg County, Kentucky—The McNarry Coal Company is preparing to open coal mines on a large tract recently secured by it near Central City. N. W. Grider, Bowling Green, Ky., is manager.

Raleigh County, West Virginia—The E. E. White Coal Company will develop a large tract of New River coal. Plans for opening mines and for machinery are now being prepared. E. E. White, Mount Carmel, Penn., is president and general manager.

Glendale, West Virginia—The Bituminous Coal Company is planning extensive work on property recently purchased. The company expects to rush the construction of a tipple, hoisting shaft and connections with the Baltimore & Ohio Railroad tracks to an early completion. The tipple will be constructed of steel. With the hoisting shaft, the mine owners will be enabled to load the coal directly into the barges on the Ohio river. Plans for the opening of the mine have been completed and approved by the board of directors. O. K. Ward, Moundsville, W. Va., will have charge of construction.

Keswick, California—The Mountain Copper Company has for some years been shipping sulphide copper ores from Keswick to sulphuric acid manufacturers on San Francisco bay, who after treating them for sulphur content, re-shipped the cinder carrying copper, gold and silver back to Keswick to be smelted. It is understood now that the Mountain Copper Company is to discontinue this practice and build a plant for making sulphuric acid on Minnesota Flat, midway between Keswick and the Iron Mountain mine, on the line of the company's private railroad from mine to smelter. The company's office is at 150 Pine street, San Francisco.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Jan. 8—The abundant rains of the past two weeks have caused numbers of placer mines all over the upper part of the State to start up. There is an abundance of water this year for the hydraulic and other gravel properties and an exceptionally good season is expected. The only thing to be feared in the higher mountains is freezing weather, but thus far there has been little or none of that.

The Governor has accepted the resignations of Fred W. Bradley, Curtis Lindley and E. A. Stent as trustees of the State Mining Bureau, and appointed in their place A. H. Ward, of Alameda; S. W. Griffin and C. T. Dean, of San Francisco. The other trustees who still remain in the board are Louis Janin, of Gaviota, Santa Barbara county, and Harold T. Power, of Forest Hill Divide, Placer county.

Meadow Lake district, Nevada county, founded in 1865, mainly by men from Virginia City, Nev., was for some years active and a town was built there with brick stores, quartz mills, etc. Then it was abandoned because the deposits could not be made to pay. Spasmodic attempts at revival have occurred every few years since, but no marked success resulted. During the last summer and fall, however, a number of the old claims have been re-located and men have been found to invest in the properties, so that a revival is expected when the winter passes. The snow in that region is very heavy in its season. The veins are large and numerous in the district, but thus far no method has been devised to work the ore at a profit, though scores of processes have been tried by different persons interested.

The talk of the miners operating the Bonanza King mine in Trinity county under an agreement with the company to take out their wages has ceased and the mine has been closed down pending the settlement of the difficulties of the California Safe Deposit and Trust Company. This is the mine the Treadwells financed by borrowing large sums from the defunct bank. The money has not been repaid and the sheriff attached the mine for the wages of 44 miners. Several hundred thousand dollars have been spent on the fine equipment of this property. Some bunches of rich ore were met and the ordinary ore is of good milling value. The expensive equipment, however, is far in advance of the known ore reserves. The mine will doubtless be re-opened when the financial difficulties are settled.

After numerous failures to organize the miners of Nevada City, they have now formed a branch of the Western Federation of Miners at that place, being encouraged by the members of the Grass Valley Miners' Union. There are many active mines, both quartz and gravel, in these districts and numerous miners are employed all the year round.

The preliminary survey of the Trinity river route of the proposed State highway through Trinity county to connect interior California with the seacoast in Humboldt county, has been completed. The road follows the main Trinity river, and runs through an excellent but only partly developed mining section. With this road numbers of mines will be able to obtain supplies, etc., much cheaper than in the past.

The construction of the new and third power station of the Oro Water, Light and Power Company, at Coal Cañon, eight miles from Oroville, Butte county, has been completed, the machinery installed and satisfactorily tested. The other two stations of the company are at Pentz, 14 miles from Oroville, and Thompson Flat, 1½ miles from the same town. The great fall of the Feather river permits the use of the water in three steps.

A deposit of talc, carrying a good quantity of gold, has been found by two prospectors named Cannon and Watkins, at Patterson, Nevada county. The deposit is 6 ft. wide, lying close to a vein of free-milling quartz 3 ft. wide. The strike is in the west rim rock of the old Badger Hill hydraulic diggings, Cherokee district. Both fine and coarse gold are found in the auriferous gouge matter.

Salt Lake City

Jan. 10—The Silver King Coalition Mines Company has been made defendant in a suit filed in the Federal court by N. Treeweek and J. Leonard Burch, as plaintiffs. The defendant is charged with having extracted 10,000 tons of ore of the value of $40 a ton from the Arthur and Conkling lode claims at Park City in which the plaintiffs claim a three-quarters ownership. The ore is alleged to have been mined and marketed by the Keith-Keans Mining Company, which has since been absorbed by the defendant company. The latter offered to compromise on a payment of $15,000 which was refused. The Silver King Coalition Mines Company has passed the usual quarterly dividend, giving as a reason the inability of the company at present to market ore except at small profit. The physical condition of the mine is said to be exceptionally good; operations will be resumed upon the return of normal metal market conditions.

The directors of the West Mountain Placer Mining Company, will post a dividend of $5000 in a few days. This corporation derived its revenue from a lease of lands and water rights to the Utah Copper Company, in Bingham cañon. The Utah Copper Company closed the year 1907 with a production of 15,000,000 lb. of copper, of which amount 3,000,000 lb. represented the December output. The mining costs for that month amounted to 31c. per ton. Eight sections of the Garfield mill are in operation.

The United States Smelting, Refining and Mining Company has ceased to accept custom ores for smelting at its Utah smelters, and preparations are being made to close them down in compliance with the injunction of the Federal court. As the mandate of the appellate court has not been received, the injunction is not yet operative. However, it is expected it will be before the end of the month. The Bingham Consolidated and Utah Consolidated smelters are closed. The independent smelter proposition has been taking form rapidly and $750,000 toward such a project has been subscribed in Salt Lake City. With practically all the lead mines in this region shut down, the American Smelting and Refining Company is beginning to complain of a shortage of ore at its Murray smelter. The plant is running now at about one-half normal capacity.

A Salt Lake and eastern syndicate has appeased the conflicting interests owning the Snowflake property in the Gold Springs district, Utah, and will organize a new company to operate it. The group consists of 15 claims adjoining the Jennie mine.

The new tramway built between the Yampa mine and smelter in Bingham is giving good satisfaction and is delivering between 600 and 800 tons of ore daily. The smelter will soon be running up to capacity again.

The construction of the smelter of the Tintic Smelting Company, in the Tintic district, is progressing rapidly and practically all the material and equipment has arrived on the ground. The plant will be blown in before the middle of April. The May Day and Uncle Sam Consolidated

mines will not pay dividends this month and possibly not again for some time. Both properties are closed on account of the unsatisfactory smelting conditions and low metal prices.

Mine-owners of the Tintic district, however, are counting on early relief through the completion of the silver-lead smelter in that district, which will probably be in April or May; and there are reasons to believe that the smelter at Ogden, owned by the Utah Smelting Company, will resume operations shortly. The Ogden smelter was built last year and operated for a time in competition with other Utah smelters, closing when the late panic came on, with losses figuring up to about $229,000. The owners now see an opportunity to make good the experiences of the past.

A meeting of Utah mine-owners has been called for Jan. 15, at which time an effort will be made to form a State association, the object of which is to promote the general welfare of those interested in the development and operation of mines.

The property of the St. Joe Mining Company, in Bingham, has been placed in the hands of a receiver. The company has been in almost constant litigation for several years.

The Boston Consolidated Mining Company has brought suit against the Rio Grande Western Railroad to enjoin the latter from basing its charges on ore haulage on the gross valuation, instead of the net valuation, as other railroads in the State are doing and have made a practice of doing in the past.

Denver

Jan. 10—Referring again to the fraud indictments brought against the owners of coal lands in Colorado by the Department of Justice, the decision of Federal Judge Lewis, dismissing the case, has been virtually sustained by the United States Supreme Court in the case of former Congressman John N. Williamson, of Oregon, who was convicted of subornation under the Timber and Stone act. In effect, this decision of the Supreme Court is that violations of the rules of the Interior Department, when such rules do not conform to the statutes, do not constitute criminal offenses. This decision is significant inasmuch as it is expected to apply practically to all of the prosecutions brought in the arid land States for alleged violations of the regulations of the Interior Department in timber and stone and coal land cases.

The Cripple Creek deep drainage tunnel heading is now 1300 ft. from the portal; bids for its further construction will be opened on Jan. 15.

The annual meetings of the Portland and the Isabella gold-mining companies will be held Feb. 3, at Cheyenne, Wyoming, in which State these companies are incorporated.

Recent reduction in treatment charges by the United States Reduction and Refining Company, which amounts to about $1 per ton on ores assaying less than ½ oz. per ton gold, and $1.50 on the general schedule on ores assaying more than ½ oz., has resulted in a wonderful impetus to the camp. Many new leases have been granted, and the output of ore, which was unprofitable until now, will be steadily and largely increased.

One reason why nearly all the transportation and drainage adits of the State have been failures from a monetary point of view, lies chiefly in the fact that the projectors failed to make contracts for the transportation of their ores and waste, and for drainage, before commencing the work. You can prevent a miner from running his ore and waste out through your adit, but when the water from his vein runs into your adit, it is not easy to stop it, or make him pay for it, unless you had an agreement beforehand. The Newhouse tunnel has suspended operations before reaching the big mines of Quartz Hill (Central City), the management giving as the chief reason that the company does not propose to drain the mines of that district for nothing, and that it has already unwatered several properties on the course of the tunnel, for which it has never received a cent in payment. It is said that work will probably be suspended until the owners of the properties ahead have agreed to pay for drainage facilities.

The output of Cripple Creek for 1907 is estimated at a little over $13,000,000, and it is expected that the Leadville output will reach $11,000,000 for the year.

Scranton

Jan. 13—The miners are entitled to an increase of 6 per cent. in the anthracite field for the month of December, this being based on the price of coal at tidewater, which was $4.81 per ton.

A fire has broken out in the temporarily idle workings of the Lincoln colliery, of the Reading Coal Company, near Tremont. The colliery has an output of 2000 tons a day.

General Manager R. A. Quinn, of the Mineral Railroad and Mining Company and the Susquehanna Coal Company, has authorized his superintendents to take measures for the improvement and reorganization of the first-aid service to the injured.

Mine Inspector Martin C. Loughlin, of the Shamokin district, has completed his report for the past year, showing a total of 19 fatal accidents and 71 non-fatal accidents, being a marked decrease as compared with the preceding year.

Luke Fidler colliery, of the Pennsylvania Coal Company, is being equipped with an electrical plant, which will include a generator-house, underground motors and electric hoisting, as well as electric lighting for the entire colliery.

Dr. A. P. Seligman, Dr. J. H. Hagenbuch, J. A. Seligman, S. G. Seligman and others from Tamaqua have purchased some coal interests in Kentucky.

For several years the officials of the Delaware, Lackawanna & Western Company have been fighting a fire in the big culm bank attached to the Woodward colliery and two large pumps have been going steadily for six months pumping water into the bank with no results. The flames now threaten to consume the entire bank.

The executive committee of district No. 1, of the United Mine Workers with headquarters in Scranton, has forwarded to President John Mitchell a report in which it is charged that a number of coal operators including the Erie and Lehigh companies, have notified the representatives of the union to keep off their properties. It is claimed that after the Strike Commission award an agreement was made that the representatives of the men should have the privilege of going to the different collieries and seeing the men on the surface.

Toronto

Jan. 10—A prospecting party sent out from New Liskeard on July 29 by the Trumpeter syndicate to examine the country north as far as James bay for minerals has reported the results of the trip to T. H. Brooks, Toronto, trustee of the syndicate. The party encountered considerable difficulties by reason of adverse weather. At Island Portage on the Abitibi river they found a formation similar to that of Larder lake, consisting of quartz with greenstone. No traces of placer deposits were found on the route from this point to James bay, but in some localities, particularly at Little Otter Portage and at the gravel ridges below New Post, Abitibi, numerous colors were found, but lack of time prevented a thorough inspection. The return journey was made *via* Moose and Mattagami rivers. Indications of copper were found between Grand Rapids and the Little Long Portage on the Mattagami, and mineral indications were also discovered at the head of Lake Lomogomasi and Pigeon Rapids. The Moose river flows through a large bed of gypsum for three or four miles, a few miles above the junction with the Mattagami. At Grand Rapids the bed of the river runs through valuable iron-ore deposits about 100 miles north of the Grand Trunk Pacific route.

The Kerr lake branch of the Temiskaming & Northern Ontario railway is expected to be completed by the middle of February. It connects with the main line about 1½ miles south of Cobalt town and runs east for about 3½ miles, giving better transportation facilities to a number of leading mines, including the University, Foster, Drummond, Kerr Lake and Lawson, and the Government mine on the Gillies Limit. Shipments from the latter are being held back until the opening of the road, a quantity of ore being ready sacked.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

TUSKALOOSA COUNTY

Yolande—The report of State Mine Inspector Gray on the accident in this mine Dec. 16 last, in which 56 men were killed, attributes the accident to the ignition of coal dust by an accidental explosion of dynamite. In reference to re-opening the mine the following rules have been recommended to the company:

1. That all coal be mined in the clear before being shot.

2. That each and every shot be examined, charged, tamped and fired by a competent shot-firer after all of the men have been withdrawn from the mines, except shot-firer, fire-boss, pumpers and other necessary employees.

3. That all holes be tamped with noncombustible material.

4. That the fire-boss be required to examine each and every working place in the mine before the men enter in the morning; that he examine the old works once a week; that he be required to place the date of the month at the face of each and every place with chalk; also date the old works and where gas is detected by safety lamp danger boards must be placed at mouth of place, warning the miners of danger.

5. That where gas accumulates in quantities sufficient to be detected by safety lamp, line brattices of plank or canvas be constructed in such a manner that a current of air will pass the face of each place in sufficient quantities to dilute and render harmless such accumulations of gas.

6. That the mine be cleaned up and kept in a clean condition.

7. It is recommended by Messrs. Hillhouse and Flynn, associate inspectors, that in addition to the mine being clean, it be thoroughly watered as often as necessary to keep down the dust.

8. That the amount of explosives allowed in the mines be limited to one day's supply.

Arizona

GILA COUNTY

Old Dominion—Hayden, Stone & Co. report that developments on the sixteenth level show the No. 1 vein to be 15 ft. wide, while on the twelfth level it was only 7 ft. wide. Of the three veins this is the lowest in grade. It runs high in sulphur, and it is expected that within a few weeks the Old Dominion will be independent of foreign ores for fluxing as far as its own ore is concerned.

California

CALAVERAS COUNTY

Eastland-Gray—Water for mining has been turned on at this property on the Calaveras river at Hagerman's ranch. Considerable prospecting has been done during the past summer. Winter work has now been started.

Utica—This famous old property at Angels has resumed operations after a period of idleness extending over several months, due to labor troubles.

INYO COUNTY

Casey—Work is progressing on the new contract for sinking 1000 ft. deeper the shaft of this property at Greenwater, which is now 500 ft. down.

Dunlap—The orebody in this group has been struck 300 ft. below where the Mexicans quit work, and at the end of the 600-ft. adit.

Greenwater & Death Valley—A contract for an additional 200 ft. to the 500-ft. shaft of this property at Greenwater has been let.

Neylon Group—D. D. Johnson, representing Eastern men has bonded this group of eight claims in the White mountain.

Red Rose.—At this mine, three miles from Laws, surface prospecting is going on to determine the continuity of the ledge. Active operations will soon begin. High-grade ore has been found.

MONO COUNTY

Golden Gate—Frank Enzensperger and W. H. Edwards are working this property under bond. New buildings for officers and men have been put up, and as soon as spring comes a new mill is to be erected, to displace that carried away by the snow slides. Albert Stent is superintendent.

NEVADA COUNTY

Golden Gate—This mine at Grass Valley, owned by C. C. Haub, after being idle some years is now being worked profitably by leasers. The leasers are re-timbering the shaft and deepening it.

Nancy Hanks—Henry Kales, owner of this mine at Maybert, is now drifting on a large vein and expects to tap the payshoot within 40 ft. A larger mill will be erected.

New York-Grass Valley—The leasers working on this property at Grass Valley made a very satisfactory clean-up at their last crushing.

Norambagua—A crushing of ore from this mine just made yielded $29.75 per ton.

PLACER COUNTY

Hidden Treasure—At this drift mine, Harold T. Power, manager, the gravel is prospecting well. Considerable ground is being blocked out and gangways opened.

Mickey Free—At this mine, formerly the Gray Eagle, they are re-timbering and cleaning out the tunnel, which is to be driven ahead to ground under the old North Star ranch.

Rueblin—A small mill, the first on the Last Chance Divide, has been started up. A larger mill is shortly to be built.

PLUMAS COUNTY

Clearmont Hill—Tye Monarch, Modoc and Mollie claims on Clearmont hill, six miles from Quincy, owned by W. E. Oddie, will be worked all winter, though in the snow belt. A number of buildings have been put up, ditches constructed and pipe lines laid. H. M. Beckley is in charge.

SAN BERNARDINO COUNTY

Bonanza—The rich ore from the north drift of this mine at Crackerjack is being sacked and stored away. The rich vein is of apparently the same size and value for the last 30 ft. down.

SHASTA COUNTY

Arbuckle—Near this place, Frank Green and associates have located 16 quartz claims, and the veins thus far prospected show up well.

Bully Hill Copper Company—The remodeled smelter at Winthrop is virtually completed. During the shut-down of the smelter active development work has been carried on in the mines at Winthrop. There and at Copper City bodies of ore have been blocked out. During the period also, the railroad from the smelter and mines to Pitt, on the Southern Pacific, above Kennett, has been under construction, by the Sacramento Valley & Eastern Railroad Company, which is owned by the Bully Hill company. These 18 miles of railroad and equipment cost $500,000. The construction of the road was not undertaken until it was known that there was enough ore in the mines to warrant the expenditure, for the road will have little

business outside of that furnished by the Bully Hill smelter and the little mining towns of Delamar (Winthrop P. O.) and Copper City (Ydalpom P. O.).

Shasta County

Garrecht—The Lorenz-Garrecht mine near the old town of Shasta has been sold to Minneapolis men by H. O. Cummins, who held it under bond from O. L. Buckow, M. Schmitz and Frank Kleinholz.

Trucott—A new five-stamp mill has been erected on this mine in Grizzly gulch, six miles from Stella, by John and J. T. Martin.

Vulcan—Good results are shown by the diamond drill in this copper mine, which is being prospected by that method. They are drilling from four stations, from 2450-ft. elevation for the highest, to the 2000-ft. station.

Sierra County

Alleghany Mining Company—This company operating the McNulty gravel mine at Balsam Flat, has commenced hydraulicking for the season, under license of the California Debris Commission. The crib and rock dam on Kanaka creek impounds the tailings. The ditch for water supply carries 1000 in. water. Balsam Flat, between Alleghany and Plumbago, was at one time a rich and productive section, until the inhibition of hydraulic mining. The deposit is a "spill" of gravel from the ancient channels under the lava cap of Balsam Flat ridge. The company expects after the water season closes to turn its energies under the ridge, drifting then in the usual way. The bedrock tunnel is to be extended beyond the old workings into new channels known to exist about 70 ft. below the old ones.

Siskiyou County

Denver Group—This group at Happy Camp has been bonded to F. H. Dakin, of Berkeley, Cal., who has men developing the orebody. Beside the gold, the ore runs high in copper.

Kuntz—Workmen doing assessment work for this company at the head of Sucker Flat, Quartz valley, have found a rich shoot of ore which has been searched for for years. The ground below, when hydraulicked, was rich in shot gold.

Old Pinery—These diggings at the upper end of Quartz valley, where some 1500 miners made handsome sums by placer mining in the early fifties, are now owned by Wm. Schell, who controls 200 acres, with two ditches. He has been working part of the ground for 35 years, but at a disadvantage through lack of dump, which he has now obtained.

Sonoma County

Culver-Baer—At this quicksilver mine, 34 flasks were made in the last 24 days. A new condenser is being installed.

Colorado

Eagle County

Eagle Mining and Milling Company—This company has been formed to work mines in this county adjacent to the Leadville district; the principal office is at Denver, but a branch office is at Red Cliff. The company is financed by Charles Hannigan, S. N. Hicks and Frank E. Gove. Work will be started on properties near the Iron Mask to prospect for the extension of the orebodies worked in that property. The ore in the Iron Mask mine is a zinc sulphide.

Iron Mask—The management has determined to close down the mine until a new mill has been erected. When the mill is completed the mines will employ about 100 men.

Black Iron—This mine on Battle mountain near Red Cliff is the largest shipper in the county. It ships 100 tons per day of high-grade manganese iron ore. The recent financial flurry has had no depressing effect on this company; as soon as the weather permits the force at the mine will be increased.

Champion—The Bohen brothers, of Leadville, who are operating this mine and the Percy Chester, are mining considerable ore, carrying gold, copper and silver.

Lake County

Luema Mining Company—An important strike of ore has been made in the shaft which is being sunk to develop the ground leased by this company on Little Ellen hill in the vicinity of the New Monarch Mining Company's ground. Warren F. Page, manager, reported at the beginning of the new year that ore had been encountered in the shaft at a depth of 100 ft. The shaft has been sunk a number of feet since then and a good body of lead carbonates has been cut carrying gold, silver and lead. The shaft will be sunk to prospect for a deeper orebody, developed in an adjoining mine. This vicinity has been inactive since the closing down of the Resurrection, Dolly B, and other mines nearby.

The Penn Mining and Leasing Company—The various sub-leases of this company on Breece hill are shipping the usual tonnage. The No. 1 shaft is sending daily considerable iron ore to the steel works at Pueblo, Colo., as well as gold ore to the local smelter; the leases on the No. 3 shaft are shipping a good grade of gold ore to the Arkansas Valley plant.

Lucy L.—In the East Tennessee district this property, owned by the Gunnell estate, and a group of claims adjacent to the Jennie June, have been leased for two years to Alfred Seabrook, representing Colorado Springs and Cripple Creek parties. The low-grade orebodies will be examined as to their suitability for cyanide treatment.

Eagle—At this group of claims in Big English gulch, ore carrying gold and copper has been developed during the past month.

Big Four—K. L. Fahnestock and T. D. Kyle, who have been leasing on the Big Four mine on Breece hill for the last two years, are installing an electric pump, having a capacity of 50 gal. per min., on the 700-ft. level. This will be the first electric pump installed in Leadville. Twenty men are working in the upper levels, and the good ore has been shipped. The ore in this vicinity occurs in small veins, but is rich.

Rock Hill—The low price of metals has not materially affected the Rock hill section, south of Leadville. The various iron leases in this section, although forced to mine their ores on a very close margin, are still working. The Crown Point, Nisi Prius and the Murphy lease, operated by John Harvey, are shipping daily a large tonnage of ore to the smelters. The Delaware shaft has been completed, and driving from the bottom of the shaft has begun. The drift is now in blue limestone; the lessees hope to find the ore-shoot which was recently cut in the shaft on the Crescentia, which adjoins the Delaware.

Teller County—Cripple Creek

Owing to the reduction of treatment charges and to the fact that many mining men have returned to the Cripple Creek district during the present dull period, several new leases have started.

Portland Gold Mining Company—The directors have issued a statement to the stockholders denying the allegation of mismanagement made by James F. Burns. Attention is called to the condition of the mine at the present time and the large amount of work done to put the mine in good shape. Besides, the ore is not of so high a grade as when Mr. Burns was in control. A letter from the mining inspector, which is included in the statement, states that the mine is in as safe a working condition as any mine in the State. The annual meeting of this company is to be held in February.

El Paso—A number of leases have been let on this property during the past week; these lessees will soon begin work. Few bids were made. The fight for control of the company still progresses. The annual meeting will be held in March.

Drainage Adit—The Drainage Tunnel Company is still working in the adit, but bids for a new contract have been advertised for; these will be opened Jan. 15. The El Paso company threw up this contract some time ago.

Abe Lincoln—The shaft house was recently burned to the ground and it is understood that the machinery was badly damaged. The property is owned by the Stratton estate and is being operated under lease by John Sharpe. The work of rebuilding has begun.

Gold Sovereign—At the annual meeting

of the stockholders, held this week in Cripple Creek, the following were elected directors for the ensuing year: O. H. Hinds, Edward Prince, H. L. Shepherd, C. G. Jackson, G. M. Saunders, A. Auer and A. Beer. O. H. Hinds now has control of the company's stock.

Illinois

Illinois Collieries Company—Foreclosure proceedings have been begun against this company, on account of default on the interest due Jan. 1 on the mortgage bonds. The court has appointed G. W. Frair, of Chicago, receiver. He is president of the company. It is a consolidation of recent date, owning eight producing mines in the central district of the State.

Kentucky

Acting under a special order from the Governor, C. J. Norwood, State mine inspector, and his assistants have begun a rigid inspection of the coal mines of the State, in order to ascertain their condition as to safety in operation. Among the special points to be investigated are the character of explosives used; the quantity of explosives safe to use where dust and gas are present; the character of the coal dust and effect of spraying upon it; the quality of the gas and its dangerous percentages; the nature, extent and insulation of the electric currents used; the character and conditions of the miners' lamps; and the probable underground fissures from which gas may come.

The attempt to order a strike at the mines in Hopkins, Christian, Webster and Union counties, as a preliminary to unionizing the miners of that district, seems to have failed. All the mines are reported at work with a full force. These mines have always been non-union.

Michigan

COPPER

Adventure—This company is carrying on diamond-drill operations near Peppard Junction; promising cores have been taken out. Operations at the old workings are in an unsatisfactory state, the rock being lean and scattered.

Hancock—No. 2 shaft has reached a depth of 500 ft. It is expected that a rate of approximately 100 ft. a month will be maintained. It is the intention to sink this shaft to a depth of about 1000 ft. At the old workings drifting is being carried on in what is known as the west vein and a good stamp rock is being accumulated on the stock pile. Hancock will probably be able to keep one head running continuously early next summer.

Winona—The steel for the new shaft house at No. 4 shaft has arrived. It is through this shaft that the southern portions of the property are to be opened up. No. 4 shaft is near the seventh level, where a station will be cut. No. 3 shaft is below the eleventh level and good stamp rock is being hoisted.

King Phillips—This property, under the management of the St. Mary's Mineral Land Company, is being opened up in a systematic manner. No. 1 shaft has reached the seventh level, where a station is being cut. This shaft is being sunk in the footwall and drifts extended from the fifth and sixth levels have encountered the lode. No. 2 shaft is down about 140 ft. and will be continued. The new compressor and battery of boilers have been delivered and will soon be assembled.

Missouri

Consolidated Zinc Company—This company recently promoted by the Wallace H. Hopkins Company, of Chicago, has instituted suit against the Joplin *Daily Globe* for $500,000 damages, because that paper branded the company as a fraud; notwithstanding that the secretary of the company admitted before an investigating committee of the Joplin Commercial Club that the company owned no properties whatever, although it claimed in its advertising to be assured of properties showing a profit of $1,750,000 yearly.

Montana

The movement to organize the mine owners of the State seems to be gaining headway, and it is expected that there will be an attendance of fully 200 at the meeting to be held in Helena on Jan. 16. The mine owners intend to make a strong fight against the alleged exorbitant rates for smelting custom ore at the East Helena plant of the American Smelting and Refining Company, and the Great Falls plant of the Amalgamated Copper Company. It is hinted that the State will be asked to lend its support toward the erection of independent refineries, as Kansas did for the oil producers.

BUTTE DISTRICT

Boston & Montana—At present 2200 men are employed in these properties and 3250 tons of ore are being hoisted daily. The capacity of the company's smelter at Great Falls is about 3600 tons daily. Fine weather has permitted the Great Northern Railway to give uninterrupted transportation service and the ore is being moved without unusual delay.

Original—The matter of retimbering a portion of the shaft of this mine is under consideration by the management. Should this work be taken up the temporary suspension of operation of the mine will not affect the Butte Reduction Works, as provision has been made to treat sufficient of the North Butte Company's ores to keep the plant in operation during the time that the shaft may be out of commission.

Butte & London—Crosscuts have been driven 200 ft. in two directions from the 1100-ft. level, one southeast and the other northwest. Seven veins have been cut, three of which are considered of importance. At present diamond drill exploration is being prosecuted from the faces of both crosscuts and drifts are being extended in two of the most promising veins.

Lizzie—This claim, owned by the Davis-Daly Estates Copper Company, is now being operated by leasers who are driving a crosscut on the 200-ft. level for the purpose of intersecting the orebody encountered on the 100-ft. level; at this point the vein is 30 ft. wide with 8 ft. of good ore. Interesting developments are looked for in a few days, when it is expected that the vein will be reached on the 200-ft. level.

MADISON COUNTY

Pony—The recent freezing weather has so far diminished the power for the Granite mill that the company has been compelled to suspend operations until spring. The mill has been running steadily for nine months, turning out a carload of $60 concentrates every two weeks. It is generally understood that the past year has been a most successful one.

Pony—E. C. Bush, who has a lease on the Clipper, has recently struck a large body of high-grade gold ore and is working hard to get out a large shipment. In the spring, at the expiration of the present lease, this property will be worked by the Burrhage people, of Boston, who hold the controlling interest.

FERGUS COUNTY

Kendall—A new body of high-grade gold ore has been opened in the North Moccasin mine. This ore is amenable to cyanide treatment and is reported to be higher in grade than any ore yet uncovered in this locality.

MISSOULA COUNTY

Missoula—The Cape Nome Mining Company, operating a copper property in the Clinton district, has let a contract for the sinking of the main shaft below the present 300-ft. level. Ten men will be employed and work will be started at once.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Shipments from the Goldfield district for the week ending Jan. 4 were as follows: Little Florence, 716 tons; Begole lease, 94; Mohawk Combination, 70; Florence Annex, 78; total, 958 tons. Most of this ore came from the dumps.

On Jan. 4 part of Federal troops left for California; two companies, comprising 135 men, remain. These are using the Merchant's hotel at Columbia for bar-

racks. The Mine Owners Association has opened an employment office in Salt Lake. George Wingfield is in charge. Jan. 8, 120 miners were shipped from Salt Lake to Goldfield by way of Los Vegas. The mine owners have offered the carpenters and electricians, who are affiliated with the American Federation of Labor, $6 per day.

Goldfield Consolidated—The plans for the cyanide mill to be erected this year have been decided upon. The Combination mill is treating 80 tons of ore per day; 60 men are working at the mine and mill. The Kinkead mill will not be started until more miners are obtained. The Mohawk shaft is being sunk; some development work is being done in the upper levels.

Little Florence—High-grade ore is being shipped from the dump of the Little Florence lease to the Globe smelter at Denver. This lease has 68 days to run after underground work is resumed. At present only surface work is being done. The waste dump of the Mohawk-Florence, another sub-lease on the Little Florence, is being screened.

Nevada-California Power Company—The new wage schedule, announced by the company to go into effect Jan. 10, provides for a maximum wages of $6 per day, a reduction of $1 from the former maximum.

ESMERALDA COUNTY—SILVER PEAK

Pittsburg Silver Peak—Seventy stamps are now dropping at the mill at Blair. A large tonnage of ore is said to be blocked out in the mine. Another good shoot of ore has been cut in the Wasson adit in the main vein of the mine.

LYON COUNTY

Nevada-Douglas—On the 550-ft. level of the Ludwig a raise has been started in the orebody. The vein on this level averages 20 ft. wide; the copper occurs mainly as chalcocite. In the Douglas mine the last 25 ft. of the main adit is in good copper ore. The incline at the Ludwig will be sunk to a depth of 850 ft. as soon as the new pump arrives. The compressor, recently installed, is working well.

NYE COUNTY—BULLFROG

Homestake—Excavations for the mill are well under way and work on the foundations has been started.

Gold Bar—The mill is completed and will be started as soon as the power line to the pumping station is finished and the pumps themselves are installed.

Mayflower—The ore shoot has been cut on the 400-ft. level 40 ft. north of the shaft. The drift has been in ore for 10 ft. There is 20 ft. of water in the shaft; this indicates that the mine will furnish sufficient water for the new mill, the plans for which are said to have been completed.

NYE COUNTY—ROUND MOUNTAIN

Hydraulic Company—The pipe-line has been covered and there is no more danger of freezing. The 2-in. giant is now piping gravel. The gravel is 6 to 8 ft. deep and somewhat cemented. The second giant has not been installed as yet. This company has a two-year lease on the placer ground. Flumes are being built to carry the water to other parts of the property where it will be used in ground-sluicing the gravel.

Round Mountain Reduction Company—Work has begun on the company's mill on Shoshone creek. The lumber is already on the ground. A bed-rock dam will be built to conserve water for milling.

NYE COUNTY—TONOPAH

Ore shipments from Tonopah mines during the week ending Jan. 2 aggregated 380 tons, divided as follows: Jim Butler, 41 tons; Tonopah Extension, 95; Midway, 203; West End, 41. The Tonopah company sent 3050, the Belmont 800 and the Montana-Tonopah 500 tons to the mills, making the total shipments for the week 4730 tons.

Tonopah Extension—The usual development is being done at this mine. As yet the drift on the 1050-ft. level has not cut any orebody. Mining is progressing on all levels above the 600-ft. The west drift on the 600-ft. level is being advanced rapidly. The plans for the 40-stamp mill, which is to be erected at the mine, are about completed.

West End Consolidated—Stoping is confined to the 400-ft. level. The west drifts and crosscuts on that level are being advanced.

Tonopah—Owing to discontinuance of shipments to the smelters, less than 20 men have been laid off. According to a statement signed by C. A. Higsbee, secretary and treasurer of the Tonopah Mining Company, the floating debt of the company now outstanding amounts to $578,240. This was borrowed to complete the construction of the mill and power plant which cost about $1,100,000. In order to pay the debt the management has decided to pay no dividends until this debt is paid. The recent fall in the price of silver has decreased the company's earnings during the past three months about $40,000. Notwithstanding this and the shut-down of the mill for about 17 days during the quarter, the net earnings for September, October and November amounted to $301,526.

Ohio

BELMONT COUNTY

Black Oak—This coal mine, near Flushing, has been sold by the Kennon Coal Company to Michael and William Gallagher, of Mount Pleasant. The mine is well equipped and the property includes 4000 acres, much of which is on No. 8 vein.

JEFFERSON COUNTY

Eastern Ohio Coal Company—This company has sold its slope mine near Bergholz, to the Ohio & Pennsylvania Coal Company, which owns property adjoining.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for November and the five months of the fiscal year from July 1 to Nov. 30 is as follows:

	November.	Five Mos.
Earnings	$4,097,949	$17,263,562
Expenses	3,692,703	15,808,990
Net earnings	$ 405,246	$ 1,454,572

For the five months there were increases of $3,239,543 in earnings; $2,333,675 in expenses; and $905,868 in net earnings. Expenses for the five months were 91.6 per cent. of earnings.

BITUMINOUS COAL

In view of the recent serious disasters in the bituminous region of Pennsylvania the mine inspectors have been urged by Chief Inspector Roderick to greater efforts to protect the miners. A special committee of five of the inspectors has been appointed by Mr. Roderick to inspect any mine in the region about which any doubt exists regarding the conditions of safety.

South Dakota

LAWRENCE COUNTY

Imperial—The Dakota shaft, being sunk to quartzite, has reached a depth of 430 ft. This will open up a new field in the Bald Mountain district.

Great Northern—Arrangements have been completed to raise enough money to carry on sufficient development work to warrant the erection of a 100-ton mill this spring. Chilean mills will be used for crushing.

Golden Reward—It is announced that work will be resumed in a few weeks on the Two Bears property, part of the holdings of E. H. Harriman in the Two Bit district, which has been idle for some years.

La Sarre—Chicago owners will work the ground commencing this month. The 50-ft. shaft will be sunk to the 100-ft. level and the gold seams now exposed, opened up.

Inter-Ocean—A 500-ft. shaft will be sunk by Manchester, N. H., men and extensive development will be done on this old property in the Tinton district.

Atlanta—Good ore has been encountered 270 ft. in the tunnel and is being opened along a vein.

Arctic—At a depth of 200-ft. the tunnel shows higher values of gold and A. D.

Ticknor is planning more extensive work this spring.

Homestake—On the 100-ft. level the company is opening up and mining some high-grade ore.

PENNINGTON COUNTY

Montezuma—President Radcliffe is back from an eastern trip and has concluded a deal with the English syndicate for an option on the company's 1700 acres in the Rochford district. This includes a five-stamp mill.

Seminole—W. E. Christiernsson, half owner of the group, has just struck the best grade of wolfram ever found in the Black Hills. The ledge is 1 ft. wide. A mill will be erected within a few months.

Ivanhoe—The new 50-ton cyanide mill is inclosed and ready for the tanks. It will be started up during the winter and mine development will be increased this month.

Belt—A hoisting engine has been installed and sinking in the shaft will proceed more rapidly on the property near Keystone.

Pittsburg—The shaft of the King Soloman claim will be unwatered to the 300-ft. level, where there is a ledge of $8 free-milling gold ore that has not been operated in 23 years. The property will undergo extensive development.

Tennessee

An association to promote the phosphate industry and to bring about a closer relation among producers and shippers was recently organized at Mt. Pleasant, Tenn. Committees were appointed to prepare and report at the meeting in January a better plan for sampling rock and to suggest a form for a standard sales contract. A canvass of the amount of rock in the field ready for shipment indicates about 11,000 tons of export rock in sheds, all sold, and 49,000 tons of domestic rock, of which 41,000 tons are for future delivery. Officers of the association are George W. Killibrew, president; Joseph A. Chapman and E. W. Faucett, vice-presidents; R. C. Jackson, secretary and treasurer. The executive committee is composed of T. E. Naw, H. D. Ruhm, Charles S. Jackson, W. B. Alexander and E. W. Faucett. The association fixed its regular dates for meeting on the first Tuesday of every month at Mt. Pleasant.

Utah

JUAB COUNTY

Tintic Ore Shipments—Owing to the closing of so many mines, shipments have decreased greatly. The output for last week was 73 carloads: Bullion Beck, 3; Beck Tunnel, 1; Centennial Eureka, 36; Colorado, 5; Eureka Hill, 5; Mammoth, 7; Scranton, 4; Tintic Iron, 10; Yankee Consolidated, 2.

Apex—The shaft at this property has been completed to 1300-ft. depth and much driving is being done on the various levels with encouraging results.

SALT LAKE COUNTY

Boston Consolidated—In the year ended Sept. 30, 1907, the company produced from its sulphide mine 6,146,925 lb. of copper at a cost of 8.65c. per lb. An important feature of the year's development was the discovery of a large body east of the fault which has hitherto limited the ore deposit. At the porphyry mine enough stripping has been done to keep the mill well supplied with ore. The cost of stripping the ore by steam shovel was 18¼c., while the cost of mining is estimated to be 40c. per ton. The company is starting its new Garfield mill and by the end of the month three sections will be in operation. At the mine near Bingham about 200 men are employed.

Columbus Consolidated—This company operating at Alta has reduced production to a minimum and will suspend dividends while metal prices are low.

Phoenix—This company, operating in Bingham, has completed its 200-ton mill and the management expects to have it in commission some time next month. An important strike of lead ore has been reported from the mine.

Utah Consolidated—Since the closing of the smelter at Murray the management is devoting unusual energy toward development. A deeper shaft is being sunk and it will probably be continued 1000 ft. below the lower adit level. The mine is said to contain a million tons of developed ore at the present time.

Washington

OKANOGAN COUNTY

Stepstone—At this property, near Nespelem, a vein of silver-lead ore has been found in a tunnel. The extent of the vein has not been ascertained, but it is 2 ft. wide where found.

West Virginia

West Virginia Coal Operators—A meeting was held in Washington, Jan. 8, at which a number of coal operators were present. It was decided to form an organization, and to invite operators from other States to form similar associations, the purpose of all being to prevent accidents in mines so far as possible. These associations will appoint permanent committees for research, investigation and dissemination of information and will coöperate with the Geological Survey and other technical departments of the Government, and will also furnish accurate information in connection with mining when called for by Congress or the State legislatures. The object will be not to oppose proper legislation, but to promote any acts with effective bearing on the preservation of life and the prevention of mining disasters, regardless of expense or regulations. The West Virginia operators elected William N. Page chairman, and Neil Robinson, of Charleston, W. Va., secretary.

FAYETTE COUNTY

Boomer Coal and Coke Company—This company has taken a contract to furnish 33,000 tons of coal monthly to the By-Product Coke Company, of Chicago. The mine has been started up, after a stoppage of two months.

RALEIGH COUNTY

E. E. White Coal Company—This company, which has secured control of a large tract of New River coal and purposes mining on a large scale, is controlled by anthracite coal men. The officers are as follows. President and general manager, E. E. White; vice-president, T. E. Snyder; secretary and treasurer, Preston V. Vought; directors, Thomas M. Righter, Voris Aughten, T. Bickel, C. A. Gabel, Mt. Carmel, Penn.; J. M. Humphrey, Centralia, Penn.; F. G. Buck, Ashland, Penn.; Edward Brennan, Shamokin, Penn.; John Laing, Charleston, W. Va.; Thomas H. Wickham, Beckley, W. Va. The company is capitalized at $500,000, and will begin work at once.

TAYLOR COUNTY

Davis—The Davis Coal Mining Company has retired from the operation of this mine near Flemington. It will be hereafter operated by Thomas E. Davis and Richard Gerstell. Their office will be at Grafton, W. Va.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of Cobalt ore for the week ended Jan. 4 were as follows: La Rose, 104,910 lb.; Nipissing, 54,410; Townsite, 45,100; total, 204,420 pounds.

Cobalt Contact—Buildings and foundations are being prepared for the new plant, a portion of which is now on the ground. When the installation is completed mining operations will be resumed on a large scale. Two cars of No. 1 ore are ready for shipment.

Coniagas—The main shaft is down to the 150-ft. level, on which extensive development work will be pushed. Considerable additions to the plant will be made during the winter.

Little Nipissing—A good vein was struck on Jan. 4, the third that has been encountered in the adit.

O'Brien Mine—A side vein of cobalt and native silver from 3 to 5 in. wide has been struck in the 100-ft. level at some distance from the main shaft.

Trethewey—A carload of high-grade ore recently shipped to the smelter realized $40,000. The vein in No. 2 shaft has improved in value down to the 90-ft. level, the 50-ft. level showing 8 in. of No. 1 ore.

NOVA SCOTIA

Dominion Iron and Steel Company—Boring operations on the Cowan coal areas at Port Morien have resulted in striking a 7-ft. seam of coal underlying which there is another seam 4 ft. thick.

Mexico

CHIHUAHUA

Benito Juarez—This company, which operates mines near Salines, is shipping three carloads of ore per week to the smelting works at Aguascalientes.

Dolores—A shipment of gold and silver bullion to the value of $100,000 was received in Chihuahua during the first week in January from this mine.

Republica—According to a report of the directors, this mine in the Rayon district during November produced 39 tons of concentrates assaying 1056 oz. silver per ton; 70 tons of concentrates have been delivered to the American Smelting and Refining Company and netted about $30,000.

Ronces Valles—Frederick Walton, of London, England, has made the last payment on this gold mine about 12 miles from Pinos Altos in the Rayon district. The property includes 14 pertenencias about a mile above the Mayo river. An option was taken on the mine in 1905.

DURANGO

Cinco de Mayo—This mine, opened a year ago in the Descubridora camp, has shipped 50 cars of copper ore to the Torreon smelter, all derived from development work, and said to be sufficient to pay all expenses.

FEDERAL DISTRICT

Nonoalco Refinery—The Société Affinage des Metaux, the new French company which recently purchased this plant from the National Metals Company, will build a new refinery and parting plant in the Santa Maria district of Mexico City. The new plant will be ready for operation in six or eight months, when the old works at Nonoalco will be abandoned.

GUANAJUATO

Mineral Railway—Supt. E. J. White is at work with a large force of men on the construction of this road which will develop a wide area of mining territory about the city of Guanajuato. The grade has been completed from San Matias to the connection with the Mexican Central in Tepetape.

Nayal Milling Company—This company, now a part of the Mexican Milling and Transportation Company, is purchasing 50 tons of custom ores per day in Guanajuato. The mill is situated in the Nayal district about five miles from Guanajuato, and is shipping about 75 tons per day, which is expected to be increased to 200 tons daily within a year.

Pinguico—Recent samplings of the high-grade orebodies in this mine gave an average assay of $109 per ton. Air drills have been installed throughout the mine. The mill, with a rated capacity of 200 tons a day, the construction of which began in Feb., 1907, was completed three months ahead of the contract time. It was expected to be ready on Jan. 1, but trial runs were made as early as October.

JALISCO

Keystone Copper Smelter Company—The remodeled plant of this company in the Tapalpa district is in operation, producing about nine tons of copper, gold and silver concentrates per day. Plans for a cyanide plant to treat the tailings are under consideration. The smelting plant erected several years ago has been abandoned.

Tatepusco—These old mines on the Santiago river in the Yesca district have been bought by W. A. Rogers, of Guadalajara from Leopoldo Romano, of Tepic. The purchase includes 12,500 acres of timber lands. The mines are "antiguas" and have not been worked since 1878.

Virginia & Mexico Mine and Smelter Corporation—This company is about to erect a complete reduction plant in the Etzatlan district, including crushers, 30 stamps, two tube mills, Wilfley concentrates and equipment for cyanide treatment of slimes.

OAXACA

Tehuantepec Silver Mines Company—This company, which bought the San Francisco mines in the Taviche district several months ago, now also controls the San Albino, El Carmen, Amplicacion de Las Animas and El Rey de Plata, all in the Taviche district adjoining the San Francisco.

PUEBLA

Teziutlan — Although the smelting works here closed down Nov. 23, development work in the mines and the construction of the new smelting works are going right ahead. It is expected that the new smelting works, which will be of 600 tons daily capacity, will be ready for operation next summer.

SONORA

Bauverico—Finch & Overlock report one car of lead-silver ore in transit from the property now being worked with a small force. Steady shipments are anticipated. Adjoining properties being worked by Martin & Owings promise to make that portion of the camp more active than it has been for some time.

Cieneguita Copper Company—This company is using five-ton automobile trucks for transporting its matte to the railroad.

Greene-Cananea—Hayden, Stone & Co. say that there is a possibility that production at the Greene-Cananea will be resumed on or before May 1, when this company will be in position to supply a monthly output of 5,000,000 lb. During the last three months the company has been broadening the developments at the Cananea Central and Cananea Duluth, and improving the smelting and transportation facilities. On the Cananea Duluth tract the new shaft is bottomed in ore assaying 15 per cent. copper and 25 oz. of silver per ton. This property and the Cananea Central are now provided with direct rail communications and equipped to supply a total of 1000 tons of ore daily. The Capote shaft is being permitted to fill with water, the purpose being to quench a fire in one of the levels. Rebuilding the smelting plant will be completed next month. The combined monthly capacity of the eight new furnaces is 100,000 tons, compared with 50,000 tons a year ago. If needs be four additional furnaces can be erected. It is more than likely that the matter of additional concentrator capacity will receive early attention, and also that a central plant will be installed from which electrical power will be transmitted to the various shafts, shops, etc. There seems excellent reason for the belief that the cost of production will next year be reduced to 10c. per lb. The company now employs about 800 men, which number is soon to be gradually increased. Its patented mineral lands comprise 60 square miles, in addition to the surface rights of a tract of more than 600 square miles.

Nacozari Consolidated Copper Company—This property under the management of J. G. Alexander is being worked steadily. It adjoins the Moctezuma Copper Company's ground and has similar surface showings.

San José Mill—The mill has resumed operations on the high-grade milling ores. The combined amalgamation and cyaniding treatment promises to be successful.

Tellurium Belt—J. L. Blackstone, of Boston, spent the past week in camp inspecting his holdings in the belt east of Cananea. Development work and ore shipments will be begun in the near future.

Africa

TRANSVAAL

The gold output for December is reported at 583,526 oz., the largest monthly production for the year. Probably it includes some extra yield from miscellaneous sources, as the last month of the year is generally made to do. For the full year the total reported was 5,786,617 oz. in 1906, and 6,451,494 oz., or $133,352,381, in 1907; showing an increase of 664,877 oz., or 11.5 per cent.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Jan. 15—The coal trade in the West is beginning to feel the pinch of hard times. The demand for steam coal has fallen off materially, and a surplus of coal is reported at several points, notwithstanding a considerable curtailment of mining.

There is general interest in the miners' meeting at Indianapolis next week. Some of the district meetings instructed their delegates to ask an increase in mining rates, but it looks like a bad time for such action. The rate conferences will follow the general meeting, probably early in February.

In the East the bituminous trade is dull, and at seaboard points surplus stocks of coal are reported. Steam coal is in light demand, with little prospect of early improvement. The coastwise trade is almost dead for the present.

The anthracite trade is also quiet, from the combined effect of light calls for steam coal and continued mild weather, which keeps down the domestic demand.

Coal Traffic Notes

Tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, week ended Jan. 4, in short tons:

	1907.	1908.	Changes.
Anthracite	48,251	24,707	D. 23,544
Bituminous	523,755	362,376	D. 161,379
Coke	213,157	69,845	D. 143,312
Total	785,163	456,928	D. 328,235

Period was five days in 1907, and four days this year.

Tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie for full year, short tons:

	1906.	1907.	Changes.
Anthracite	4,580,018	5,691,983	I. 1,111,965
Bituminous	32,398,081	39,718,356	I. 7,320,275
Coke	12,732,989	13,047,593	I. 314,604
Total	49,711,088	58,457,932	I. 8,746,844

The total increase in 1907 was 17.6 per cent.

Chesapeake & Ohio coal tonnage, five months, July 1 to Nov. 30, short tons:

	Coal.	Coke.	Total.
New River	2,584,346	105,183	2,689,529
Kanawha	2,288,002	47,484	2,335,486
Kentucky	132,894	.....	132,894
Connecting lines	128,422	42,672	171,094
Total	5,133,664	195,339	5,329,003
Total, 1906	3,968,361	156,818	4,125,179

Deliveries points west of mines, 2,581,832 tons coal and 97,732 coke; points east, 793,094 tons coal and 54,935 coke; tidewater, 1,630,316 tons coal.

Anthracite coal shipments in December were 5,781,721 long tons, making the total for the year 67,109,393 tons, an increase of 11,410,798 tons over 1906.

Anthracite shipments by lake, as compiled by Brown & Co., of Buffalo, were 2,838,843 tons in 1906, and 3,693,966 in 1907; an increase of 855,123 tons. The larger shipments in 1907 were to Superior, Wis., 1,116,058 tons; Milwaukee, 867,898; Chicago, 809,990; Fort William, Ont., 128,576; Sheboygan, 112,162; Waukegan, 108,119 tons.

New York

Anthracite

Jan. 15—The condition of the hard coal market accurately reflects the mildness of the winter thus far. What activity there is is confined to the sizes finer than stove. Broken and egg are in abundant supply, with but little demand. Stove and chestnut are scarce with nearly everybody, while, in the fine sizes, many companies decline to take new orders except at an advance over contract prices. Current quotations are as follows: Broken, $4.50 @4.75; egg, stove and chestnut, $5; pea, $3.25@3.50; buckwheat, $2.75@3; rice, $2.15@2.25; barley, $1.75 per ton, f.o.b. New York harbor.

Bituminous

The soft coal trade along the Atlantic seaboard is very nearly in a dormant condition, into which it fell at the time of the financial stringency. The present cessation in the demand for steam coal is due not so much to the idleness of manufacturing plants, as to the unwillingness of the still active factories to run up new bills for fuel—the cash to pay them being scarce—as long as old supplies of coal hold out. This is particularly true of New England, in which territory, we have just heard, the traveling agent for a prominent coal producer has not secured an order for weeks. As soon as old stocks shall be exhausted, demand will start afresh, but it is to be regretted that more manufacturing concerns are not now in a position to profit by the present bottom prices.

A feature of the present situation is the great accumulation of coal at tidewater ports. At some of the lower New York shipping points cargoes have been allowed to congest until the railroads have been obliged to embargo shipments by certain producers. This has resulted in suspensions of mining at numerous points. Some operations—mainly the smaller ones—have closed down, and many others are working part time, or at a financial loss, merely for the sake of preserving their organizations. The congestion of coal in New York harbor has also caused many shippers to sell their cargoes at any price; $2.20 is common for good grades of Clearfield coal.

Vessel rates to New England show the effect of a slack demand. Charters can be made from New York to New Haven at as low as 30c. per ton, and the rates from Virginia ports and Philadelphia to the far East show corresponding declines.

Birmingham

Jan. 13—The feature of the coal-mining industry in Alabama for the past week or two has been the effort by the Alabama Consolidated Coal and Iron Company to change the operation of the mines at Searles and elsewhere in this district to the open-shop plan. Advertisements were inserted in the papers calling for non-union men and quite a number of miners were secured for the work. There is but little heard from the union miners, though their organization is still intact.

The coal production in this State is healthy and there is a demand for all that is being gotten out. Good prices still obtain. Coke is in better demand since the turn of the year and indications point to the necessity of starting up more ovens.

There are less than a dozen mines in this State which are idle, while the majority of the larger mines are being worked to their full capacities.

Chicago

Jan. 14—The coal market seems to be gaining somewhat. Production has been curtailed, though not enough as regards Illinois and Indiana coals, to free the market from demurrage discounts. Gradually the demand for steam coals is increasing, though the mild weather forbids an active market.

Illinois and Indiana sell for $2@2.75 for most of the lump and prepared sizes; $1.65@1.85 for run-of-mine and $1.30@1.40 for screenings. The market for fine coals is unusually strong.

Eastern coals are firm because of curtailment of shipments; they are in light though steady demand. Hocking at $3@3.15 (the latter being circular price); smokeless at $3.30@3.40 for run-of-mine, and $3.85@4.10 for lump; Youghiogheny at $3.15 for ¾-in. gas, represent the market. Anthracite sells somewhat better in all sizes; chestnut is still scarce and in demand.

Cleveland

Jan. 14—There has been a marked scarcity of slack coal this week and prices have advanced 10 or 15c. This advance has been occasioned by the loading of only few cars of lump coal at the mines, little slack being sifted. No. 8 district slack is quoted, at mine, 75@80c.; ¾-in. lump, 95c., and mine-run, 85@90c. Dealers state that it will be two more weeks before an adequate supply can be secured to meet the local demand, and this has brought on a rush to stock up.

Indianapolis

Jan. 13—Interest here centers in the convention of the United Mine Workers, which will begin Jan. 21. The general disposition, so far as it can be gathered at present, is in favor of a revival of the Interstate Agreement.

Contrary to general supposition, Mr. Mitchell does not retire from office until April 1, and will be in charge of the convention and the conferences with the operators. That the miners will demand a general increase in the mining scale of the four competitive States is indicated by resolutions passed by district meetings, but whether the operators will grant an increase is another question; however, the miners believe that they will get part of their demands at least. The operators are maintaining a noticeable silence, but it is not significant since it is generally understood that both operators and miners desire the reëstablishment of the joint relation and joint agreements.

Pittsburg

Jan. 14—There seems to be a slight improvement and prices are firm on the basis of $1.15 a ton for mine-run coal at mine. Slack has advanced considerably and is strong at 80c. a ton. The railroad coal mines continue to operate to about 60 per cent. of capacity and the river mines are running full. The rivers are navigable again and preparations are being made to send out a number of tows this week. The Pittsburg district of the United Mine Workers of America opened the annual convention here today and will be in session all week. The delegates to the national convention which will open in Indianapolis next week, it is learned, will receive positive instructions not to consent to a reduction.

Connellsville Coke—The market continues weak and there is very little contracting for coke for delivery through the year, or for the first half. Prices remain at $2@2.25 for furnace coke on contract, but for prompt shipment probably 25c. less can be done. Foundry coke has declined a trifle and is quoted this week at $2.50@2.65. According to the *Courier* the total production in the Connellsville regions for the week was 128,838 tons. The shipments aggregated 5326 cars distributed as follows: To Pittsburg, 2364 cars; to points west of Connellsville, 2484 cars; to points east of Connellsville, 478 cars.

Iron Trade Review

New York, Jan. 15—The revival in business so far is light, and the markets generally are quiet. In pig iron there is nothing new, except in small orders, and the total of these is not heavy. Some business is in sight in structural steel, but there seems to be no hurry about it. There is nothing new in rails. The railroads do not seem to be ordering any new work at present.

Some adjustments of prices are under consideration, but it does not seem probable that any important reductions will be made at present. The plan of maintaining prices will have further trial.

Pig Iron Production—The aggregate weekly capacity of the anthracite and coke furnaces in blast on Jan. 1, according to the *Iron Age,* was 232,652 tons, or only about 45 per cent. of the average for the four months July-October of last year.

Baltimore

Jan. 14—Arrivals of iron ore for the week were 9400 tons, from Cuba. A cargo of manganese ore, 6650 tons, from India. Among other imports was a lot of 22,209 bags silver ore, from Peru.

Birmingham

Jan. 13—Sales of pig iron, though in small lots, continue with frequency in the Birmingham district. The aggregate of these sales is good and some inroad is being made into the surplus iron which gathered on the furnace yards following the collapse of the iron market in October. It is estimated now that the accumulated iron in this district will hardly go above 55,000 tons, against 90,000 tons reported the middle of December. This improved condition has brought about a better feeling as to quotations. The larger companies are holding their product firmly for $13.50 per ton, No. 2 foundry. Reports as to iron being sold at $12.75 and $13 are traced to a little iron in the hands of the receivers of the Southern Steel Company and to some manufactured by the smaller companies. The cast-iron pipe makers are buying iron cautiously. It is announced that their trade is picking up.

Foundries and machine shops are looking for improvement in general conditions. The rolling mills are still quiet in this district. The production of steel continues steady with a good demand for all the rails that can be made.

The affairs of the Southern Steel Company are still in the bankruptcy court. The election of trustees will be followed, it is stated, by a resumption of operation of the various plants of the company. The Tracy-Buek Iron Company has filed a petition in the Federal Court, which suggests a disintegration of the properties of the Southern Steel Company.

Chicago

Jan. 13—There are no important changes in the iron market yet. Melters continue to buy in small quantities; users of iron and steel products are not giving large orders; furnaces have curtailed production to the no-surplus point. This in brief is the market.

Southern iron has sold for $13@13.50 Birmingham ($17.35@17.85 Chicago) and Northern for $18@18.50, No. 2 iron in each case. Furnace agents profess to be prepared to stand any raid calculated to reduce these prices. Lake Superior charcoal iron sells at $23@23.50, the demand being light but fairly steady.

Coke is very dull, light shipments of Connellsville bringing $5.40, Chicago.

Cleveland

Jan. 14—Iron-ore stocks are moving slowly from dock to furnace, owing to the light capacity at which Valley furnaces are running.

Pig Iron—Quotations are a trifle firmer, but sales are reported light. Deliveries for the first quarter are being taken slowly and some contracts for last half are known to have been cancelled. The following prices are quoted for first quarter: Bessemer, $19.90; No. 1 foundry Northern, $17.75@18.25; No. 2, $17.25@17.75; No. 3, $16.75@17.25; No. 2 Southern, $17.35@18.35; gray forge, $16.75@17.25; Lake Superior charcoal, $23.50@24 per ton.

Philadelphia

Jan. 15—The expectation of a re-arrangement of prices for pig iron toward the close of this month, either by failure to stick together or by a general agreement to modify quotations downward, is resulting in a general withholding of orders until the situation holds up. Prices have been quietly broken from 25 to 50c. per ton in this territory and this fact strengthens the belief that iron will be lower Feb. 1. Sales in this territory have been moderate. There are comparatively few inquiries, although makers of pig iron believe that there will be an active demand before long, though it may be confined to small lots. Basic iron is quoted at $17 delivered, which brings out very little business. No. 2 foundry is quoted at $18@18.50; Gray forge at $16.50. Some low phosphorus has been sold at $24.50.

Steel Billets—The most inviting concessions which have been offered have not brought out large orders. Forging steel is selling in small lots at $33.50@34.

Bars—Best refined iron is quoted at 1.75c. with scarcely any inquiry for forward delivery.

Sheets—Vigorous efforts are being made to induce the placing of orders, but the business does not count.

Pipes and Tubes—The business is rather light and liberal concessions can be had to large buyers.

Plates—The plate mills are doing a little more business than in December. Boiler steel is held at 2.05c.; fire-box at 2.40c. for locomotive and 2.30 for marine.

Structural Material—Quotations continue at 1.85@2c. and orders are of a very retail sort.

Scrap—The scrap market has retained the activity which it had last week with reference to the lower grade such as stove plate, wrought turnings and machinery cast.

Pittsburg

Jan. 14—The only improvement in the iron and steel markets during the week was in tin-plate. More mills have been started and others will be going before the end of the month. The reduction in prices has brought out a number of new inquiries and some large contracts are expected to be closed this week. The American Sheet and Tin Plate Company now has a total of 124 of its 242 tin mills running. The majority of the independent tin mills are in operation. Arrangements have been made to start the big Ohio works at Youngstown of the Carnegie Steel Company on Jan. 19, if the improvements that have been under way for several months are completed in time. This plant will go on sheet-bars and tin-plate bars exclusively, the product being for the tin-plate interest of the Steel Corporation. There are no other changes in mill conditions. New business in finished iron and steel products is extremely light, but specifications on old contracts are coming in freely and the mills that were running last week are still in operation.

The bi-monthly examinations under the wage scale of the Amalgamated Association were made during the week. In bar iron the average sales for November and December were found to be 1.55c., which reduces the pay of the puddlers from $6.50 to $6.37½ a ton. The wages of the finishers are cut about 1 per cent. The average for sheets remains at 2.40c., which fixes the wages of skilled sheet-mill workers at 2.6 per cent. above the base of the scale. The average price of tin-plates was $3.70 a box, or 30c. above the base of the scale and gives the tin-plate workers 6 per cent. advance over the base.

Pig Iron—Conditions in pig iron are depressing. The most important transaction of the week was the sale of 300 tons to a local concern. The price is said to be about $17.50, Valley furnaces, as one furnace quoted $17.65 and did not get the order. Several small lots for prompt shipment were sold at less than $18. Foundry iron has dropped to $16, basic to $16.25 and gray forge to $15.25, all f.o.b. Valley furnaces. These low prices, however, are not bringing out much business. An effort is being made to maintain a differential of $1 a ton between bessemer and basic iron.

Steel—Billet makers are still holding both bessemer and open-hearth billets at $28 a ton; sheet-bars and tin-plate-bars at $29. Tank plate is firm at 1.70c., but there are indications that the price of 1.60c. for steel bars will be cut. The price of iron bars has been reduced to 1.55c. and for Western shipment the rate is 1.40c. Pittsburg. These new rates were adopted at a meeting of bar-iron makers held in Pittsburg during the week..

Sheets—Business in sheets shows some improvement since the recent cut in prices was announced, but so far few idle mills have resumed operations. Black sheets are quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferro-Manganese—The market continues dull and the price remains around $50 a ton.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Jan. 15.
At all United States Ports in Nov. and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1907..	$ 615,169	$63,463,036	Imp. $62,847,867
" 1906..	1,963,757	8,935,274	" 6,971,517
Year 1907..	54,211,240	98,837,722	" 44,626,482
" 1906..	44,828,263	147,962,143	" 103,133,880
Silver:			
Nov. 1907..	4,187,378	3,350,076	Exp. 837,702
" 1906..	4,561,830	3,351,981	" 1,209,849
Year 1907..	57,212,168	41,437,995	" 15,774,173
" 1906..	53,552,186	40,228,572	" 13,323,614

Exports of gold from the port of New York for the week ended Jan. 11 were $5925 gold to the West Indies; of silver, $687,593, chiefly to London. Imports of gold were $3,633,385, chiefly from Great Britain; of silver, $151,680, from Mexico and South America.

Specie holdings of the leading banks of the world, Jan. 11, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$206,732,500
England	$173,857,040	.....	173,857,040
France	534,867,645	$183,107,200	717,974,845
Germany	148,510,000	41,160,000	189,670,000
Spain	78,315,000	128,460,000	206,775,000
Netherlands	38,250,000	22,217,000	60,467,000
Belgium	18,080,000	9,040,000	27,120,000
Italy	182,285,000	23,500,000	205,785,000
Russia	586,175,000	27,215,000	613,390,000
Aust.-Hungary	229,040,000	58,645,000	287,685,000
Sweden	19,530,000	.....	19,530,000
Norway	8,200,000	.....	8,200,000
Switzerland	15,095,000	.....	15,095,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Silver Market

SILVER AND STERLING EXCHANGE.

Jan.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Jan.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
9	4.8550	56	25 1/16	13	4.8525	56 3/8	26 1/16
10	4.8555	54 3/4	25 3/16	14	4.8545	55 3/8	25 13/16
11	4.8525	55 1/4	25 5/16	15	4.8540	55 5/8	25 11/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Silver has been more erratic lately and has shown no pronounced tendencies. The United States Government continues in the market as a purchaser but how long it will be a buyer is problematical.

In the table of daily prices published last week, the price of silver in New York on Jan. 2, was given at 54¼c., through a typographical error. It should have been 54⅛ cents.

Other Metals

Jan.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
9	13¾ @14	13⅝ @13¾	62	27	3.60 @3.65	4.40 @4.45	4.25 @4.30
10	13¾ @14	13⅝ @13¾	62⅜	27	3.60 @3.65	4.45 @4.50	4.30 @4.35
11	13¾ @14	13⅝ @13¾	.....	27¼	3.60 @3.65	4.50 @4.55	4.35 @4.40
13	13⅞ @14⅛	13¾ @13⅞	63	27½	3.65 @3.70	4.55 @4.60	4.40 @4.45
14	13⅞ @14⅛	13¾ @13⅞	63⅞	27¾	3.65 @3.70	4.55 @4.60	4.40 @4.45
15	13⅞ @14⅛	13¾ @13⅞	64¼	27¾	3.70 @3.75	4.55 @4.60	4.40 @4.45

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter brands command a premium.

Copper—In the face of renewed activity in Europe, domestic consumers remain strangely indifferent, and it is almost a revelation to what extent the metal is being absorbed abroad. A very heavy business for export in electrolytic copper has been reported during the week, while Lake copper is rather neglected. The market closes firm and higher at 13⅞@14⅛c. for Lake copper; 13¾@13⅞c. for electrolytic in ingots, cakes and wirebars. The average at which business in casting copper has been done during the week is 13⅜@13⅝c.

The standard market in London advanced gradually from day to day, and closes at the top figures, £64 5s. for spot, £64 10s. for three months.

Refined and manufactured sorts we

quote: English tough, £59 10s.@£60 10s.; best selected, £67 10s.@£68 10s.; strong sheets, £70 10s.@£71 10s.

Exports of copper from Atlantic ports for the week were 8530 long tons, chiefly to France and Germany.

Tin—The London market has been very active and considerable business took place at advancing prices. Our market followed closely that in London, and while transactions were of small volume only, the market nevertheless kept firm and closes at about 27¾c. per lb. London cables £125 10s. for spot, £126 5s. for three months.

Lead—There has been a better inquiry and as a result fair-sized sales were effected from day to day at advancing prices. The market closes steady at 3.70@3.75c. New York.

The London market eased off somewhat, and the close is cabled at £14 7s. 6d. for Spanish lead, £14 10s. for English lead.

Spelter—The market advanced further, particularly in the early part of the week, on account of liberal orders which were being placed by consumers and speculators. At the close a quieter tone prevails, but prices are holding fairly steady at 4.55@4.60c. New York, 4.40@4.45c. St. Louis.

The European market at last shows more life and a large buying movement which developed there caused advances from day to day, the close being cabled at £20 7s. 6d. for good ordinaries, £20 12s. 6d. for specials.

The National Zinc Company, of Bartlesville, Okla., has started its furnaces.

Zinc Sheets—The base price is $7 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

Antimony—The better feeling noted last week has developed into considerable activity. Prices are a little irregular. Both Hallett's and Clarkson's are selling for 9c.; it is unusual for these brands to be quoted at the same price; 8⅜c. is quoted for ordinary brands.

Nickel—For large lots, New York, the chief producer quotes 45@50c. per lb. according to size and terms of order. For small quantities, 50@65c., same delivery.

Quicksilver—New York quotations are $45 per flask for lots of 100 flasks or over, and $46 for smaller orders. San Francisco quotations are $44.50@45.50 for domestic orders; for export nominal, at about $1.50 lower. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

Cadmium—The price is $1.25 f.o.b. Cleveland in 100-lb. lots. A higher price is asked for smaller lots.

Platinum—The market is quiet and prices are unchanged at $28.50 per troy ounce for hard metal; $26 for ordinary; $17@18 for scrap.

Missouri Ore Market

Joplin, Mo., Jan. 11—The higher price reported paid for zinc was $39 per ton, on an assay base price ranging from $34 to $37 per ton of 60 per cent. zinc, and averaging, all grades of ore, $34.12. The highest price for lead is somewhat in doubt, as producers claim offers of $49 were made; every buyer denies that he paid that price, but intimates that another buyer did pay it. It is known that $47 was paid, with medium grades selling from $42 to $46, and averaging, all grades, $45.96.

Expectations of a moderate increase in the output of ore, warranted by the restarting of a half dozen mills, with a producing capacity of 450 tons, were swept away by a blizzard that broke over the district Friday night, raging all day Saturday, closing down nearly every mine in the district for the day. The weather has been so mild that preparations for bad weather were delayed. Open ponds are filled with slush, which is turning to ice, and will further regard wet concentration.

Following are the shipments of zinc from the various camps for the week:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	1,602,820	1,139,490	$55,058
Joplin	1,684,730	158,550	34,829
Galena	573,490	38,400	10,346
Duenweg	500,860	22,350	9,529
Oronogo	436,910	4,600	7,923
Badger	351,150	.....	6,672
Granby	450,000	13,000	4,286
Alba-Neck	195,030	14,050	4,126
Aurora	247,030	.....	3,603
Spurgeon	211,770	8,980	2,384
Prosperity	116,040	9,030	2,295
Quapaw-Baxter	52,950	20,780	1,357
Wentworth	61,080	.....	1,038
Zincite	52,500	.....	945
Totals	6,536,360	1,428,230	$144,391
2 weeks	13,320,330	2,124,420	$ 270,691
Zinc value, the week, $111,558; 2 weeks, $			222,537
Lead value, the week, 32,833; 2 weeks,			48,154

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.58
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	45.98	May	78.40	79.56
June	43.83	44.82	June	80.96	73.66
July	43.25	45.79	July	74.31	58.18
August	43.56	43.22	August	75.36	59.54
September	42.58	40.11	September	79.64	53.52
October	41.55	39.83	October	79.84	51.40
November	44.13	35.19	November	81.98	43.40
December	43.68	30.87	December	81.89	37.71
Year	43.24	43.68	Year	77.40	68.90

Wisconsin Ore Market

Platteville, Wis., Jan. 11—This week, $35 per ton was the highest price paid for zinc ore on a basis of $34 per ton for 60 per cent. zinc. The shipments reported are the lightest recorded since the slump began but indications point toward the reopening of many mines at an early date. An open market and better prices are expected from the increased activity on the part of buyers. The price offered and paid for 80 per cent. lead ore jumped to $22 per thousand this week, but no shipments of lead are reported.

Shipments for the week were as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	272,420	.....	.....
Benton	203,480	.....	.....
Linden	171,190	.....	.....
Hazel Green	150,000	.....	.....
Cuba City	101,000	.....	.....
Total	898,090	.....	.....
Year to Jan. 11	2,169,560	.....	.....

Other camps made no shipments, except Livingston, which is not reported.

Chemicals

New York, Jan. 15—The general market is still quiet. Consumers seem to be uncertain as to their future requirements and are also, probably, looking for lower prices. At any rate they are not buying except for present requirements.

Copper Sulphate—Buying is light and for immediate needs. Quotations are unchanged at $5.50 per 100 lb. for carloads and $5.75 for smaller lots.

Mining Stocks

New York, Jan. 15—The general stock markets continued to gain during the week, chiefly on account of easier money and some consequent revival of speculation. The gains were rather irregular, however, and at the close there was some tendency toward a reaction evident.

The curb market was also a little irregular, but stronger and more active, on the whole, than in the previous week, especially in the copper stocks. Cumberland-Ely and Nevada-Utah were the more active stocks. The Goldfield and Tonopah issues, which have been heavy, are showing signs of a revival, and more interest has been taken in the Cobalt stocks. Like the general market, however, the curb showed some signs of weakness at the close. The Homestake Mining Company has declared a dividend of 50c. a share for January. This is the first since April, 1907, when dividends were suspended on account of the fire in the mine. A sale of 130 shares of Homestake stock was reported this week, at $68 per share.

Boston

The money market has been easy and speculation has been more active. The Boston market has been broader and stronger than for some time past.

Calumet & Hecla scored a considerable rise, selling at $675 today. This was the signal for a general advance in the copper shares, great and small. Tamarack sold at $72; North Butte at $47.75; Copper

Range at $63. Nearly all the active stocks gained.

The curb was also strong and active with more trading than has been seen for some time.

At the Balaklala meeting today the count showed the Lawson party in a majority, but the business of the meeting was not concluded.

At the Utah Copper meeting on Jan. 24 stockholders will be asked to authorize the issue of $900,000 additional stock and $1,500,000 convertible bonds.

Osceola directors have voted to declare no dividend for the second half of 1907. This was generally expected, and had no effect on the market.

STOCK QUOTATIONS

NEW YORK	Jan. 14
Name of Comp.	Clg.
Alaska Mine	....
Am.Nev.M.&P.Co.	....
Amalgamated	53½
Anaconda	33¼
Balaklala	2⅝
British Col. Cop.	5½
Buffalo Cobalt	....
Butte & London	⅞
Butte Coalition	16⅝
Butte Cop. & Zinc	....
Cobalt Contact	....
Colonial Silver	¾
Cum. Ely Mining	7¾
Davis Daly	4¼
Dominion Cop.	1 15/16
El Rayo	2
Foster Cobalt	.63
Furnace Creek	.29
Giroux Mine	3⅜
Gold Hill	1 1/16
Granby, New	....
Greene Gold	....
Greene G. & S	½
Greenw'r & D.Val.	....
Guanajuato	2⅝
Guggen. Exp.	....
Hanapah	....
McKinley Dar.	1
Micmac	3⅞
Mines Co. of Am.	1¾
Mitchell Mining	....
Mont.Sho. C.(New)	5
Nev. Utah M. & S	4¾
Newhouse M. & S.	9¼
Nipissing Mines	7
Old Hundred	1
Silver Queen	....
Stewart	....
Tennessee Cop'r.	30
Union Copper	1 1/8
Utah Apex	....
West Columbus	....

N. Y. INDUSTRIAL	
Am. Agri. Chem.	16
Am. Smelt. & Ref.	78¼
Am. Sm. & Ref., pf.	95¼
Bethlehem Steel	14
Colo. Fuel & Iron	21⅝
Federal M. & S., pf.	67⅜
Inter. Salt	....
National Lead	42
National Lead, pf.	90
Pittsburg Coal	....
Republic I. & S.	18¾
Republic I. & S., pf.	71⅛
Sloss-Sheffield	41
Standard Oil	494
Tenn. C. & I	....
U. S. Red. & Ref.	....
U. S. Steel	30½
U. S. Steel, pf	95⅛
Va. Car. Chem	18½
Va. I. Coal & Coke	....

ST. LOUIS	Jan. 11	
N. of Com.	High.	Low.
Adams	.30	.25
Am. Nettie	.03	.02
Center Cr'k	2.25	1.50
Cent. C. & C.	68.00	66.00
C.C. & C. pd.	76.00	75.00
Cent. Oil	100.00	90.00
Columbia	4.50	2.00
Con. Coal	27.00	25.00
Doe Run	120.00	110.00
Gra. Bimet.	.25	.20
St. Joe	13.00	12.00

BOSTON	Jan. 14
Name of Comp.	Clg.
Adventure	3
Allouez	31
Am. Zinc	24
Arcadian	5¾
Atlantic	12
Bingham	4
Boston Con	14⅞
Calumet & Ariz.	109½
Calumet & Hecla	675
Centennial	28
Con. Mercur	....
Copper Range	63
Daly West	8½
Franklin	9½
Greene-Can	7⅜
Isle Royal	23
La Salle	17½
Mass	3¾
Michigan	12½
Mohawk	53
Mont.C.&C. (new)	....
Nevada	....
North Butte	47¾
Old Colony	....
Old Dominion	33½
Osceola	89½
Parrot	13½
Phoenix	....
Quincy	90½
Rhode Island	4⅛
Santa Fe	2¼
Shannon	12½
Tamarack	72
Trinity	17¾
United Cop., com.	7¼
U. S. Oil	10½
U. S. Smg. & Ref*.	33½
U.S.Sm. & Re.,pd*.	39
Utah Copper*	34¾
Victoria	5⅝
Washington	....
Winona	5¾
Wolverine	....
Wyandotte	....

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	60
Ariz. Com	....
Black Mt.	4¼
East Butte	5
Hancock Con	....
Keweenaw	4½
Majestic	1½
Raven	.92
Shawmut	.37
Superior	15¾
Superior & Pitts	11¾
Troy Man	.60

LONDON	Jan. 15
Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	0 13 9
Esperanza	1 7 6
Tomboy	1 7 6
El Oro	1 2 6
Oroville	0 13 0
Somera	. . .
Utah Apex	. . .
Ariz. Cop., pfd.	. . .
Ariz. Cop., def.	. . .

Cabled through Wm. P. Bonbright & Co., N.Y.

NEVADA STOCKS. Jan. 15. Furnished by Weir Bros. & Co., New York.			
Name of Comp.	Clg.	Name of Comp.	Clg.
TONOPAH STOCKS		Golden Sceptre	...
Belmont	.75	Homestake King.	.60
Extension	1.37½	Montgomery Mt.	.11
Golden Anchor	.03	Mont. Shoshone C.	4.25
Jim Butler	.40	Original Bullfrog.	.02
MacNamara	.19	Tramp Cons	.18
Midway	.68	MANHAT'N STOCKS	
Montana	1.85	Manhattan Cons.	.21
North Star	.10	Manhat'n Dexter.	.07
Tonopah & Cal.	...	Jumping Jack	.05
Tono'h Mine of N.	5.25	Stray Dog	.09
West End Con	.32	Indian Camp	.05
GOLDFI'D STOCKS		GREENW'R STOCKS	
Adams	.06	Furnace Creek	...
Atlanta	.33	Greenwater & D.V.	...
Blue Bell	.09	Green'rCop.M.&S.	...
Blue Bull	.19	United Greenwa'r	...
Booth	.17	MISCELLANEOUS	
Columbia Mt.	.17	Golden Boulder	.10
Comb. Frac	.73	Hayseed	.30
Cracker Jack	.07	Lee Gold Grotto	.10
Dia'dfield B. B. C.	.20	Nevada Hills	2.75
Goldfield Belmont	.13	Nevada Smelting.	1.62½
Goldfield Con.	5.16¾	Pittsburgh S. Pk.	1.47½
Goldfield Daisy	.95	Round Mt. Sphinx	.31
Goldfield Mining	...		
Great Bend	.17		
Jumbo Extension	.60		
Jumbo Mining	...		
Katherine	.06		
Kendall	.12		
Laguna	...		
Lone Star	.10		
Lou Dillon	...		
May Queen	.05		
Mohawk	...		
Oro	.10		
Red Hill	.38		
Red Top	...		
Roanoke	.07		
Sandstorm	.22		
Silver Pick	.30		
St. Ives	.50		
Triangle	.07		
BULLFROG STOCKS			
Amethyst	...		
Bullfrog Daisy	...		
Bullfrog Mining	.06		
Bullfrog Nat. B.	.11		
Gibraltar	.09		
Gold Bar	.36		

COLO. SPRINGS Jan. 11	
Name of Comp.	Clg.
Acacia	6¼
Black Bell	....
C. C. Con	4¼
Dante	7¼
Doctor Jack Pot.	6¾
Elkton	50
El Paso	26½
Findlay	38
Gold Dollar	....
Gold Sovereign	4
Isabella	29⅞
Index	....
Jennie Sample	....
Jerry Johnson	7
Mary McKinney	....
Pharmacist	....
Portland	1.03½
Un. Gold Mines	6½
Vindicator	80
Work	14⅝

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Cement	Jan. 23	$0.30	$60,000
Anaconda	Jan. 15	0.50	600,000
Bunker Hill & Sullivan	Jan. 4	0.20	60,000
Camp Bird, Ltd	Feb. 3	0.24	246,800
Cent. C. & C., com	Jan. 15	1.50	76,875
Cent. C. & C., pfd	Jan. 15	1.25	23,438
Doe Run	Jan. 15	0.50	29,531
Empire Steel, pfd	Jan. 1	3.00	75,000
Gen. Chemical, pfd	Jan. 2	1.50	150,000
Georges Creek C. & I.	Jan. 22	2.50	55,000
Homestake	Jan. 25	0.50	109,200
Kerr Lake	Jan. 31	0.15	90,000
Maryland Coal	Jan. 15	4.00	75,400
McKinley Darragh	Jan. 15	0.04	80,000
Monon Con. C. & C., pfd	Jan. 25	3.50	350,000
Montezuma M. & S.	Jan. 10	0.04	40,000
New Idria	Jan. 1	0.02	20,000
Nipissing	Jan. 21	0.15	180,000
Tenn. Copper Co.	Feb. 15	1.25	218,750
United Metals Selling	Jan.	7.50	375,000
U. S. Smelting, com	Jan. 15	0.50	233,715
U. S. Smelting, pfd	Jan. 15	0.87½	304,646
United Verde	Dec.	0.75	225,000
Utah Con	Jan. 15	0.50	450,000
Va. Car. Chem., pfd	Jan. 15	2.00	360,000

Assessments

Company.	Delinq.	Sale.	Amt.
Crown Point, Nev	Nov. 26	Dec. 19	$0.10
Del Monte, Cal.	Nov. 20	Dec. 11	10.00
Emerald, Utah	Dec. 14	Jan. 11	0.01
Etna-King, Cal.	Dec. 14	Jan. 6	0.03
Hale & Norcross, N.	Dec. 6	Dec. 23	0.10
New Stockton, Utah	Dec. 23	Jan. 20	0.02½
Pacific Tin M. Al'ka	Nov. 30	Dec. 20	0.02
Pittsburg C., Utah	Dec. 2	Dec. 23	0.01
Posey Canyon, Utah	Dec. 6	Dec. 23	0.01
Progressive, Utah	Dec. 16	Jan. 6	0.01
ProvidentOilMg.,Ca.	Dec. 7	Dec. 27	0.01½
Rescue, Nev	Dec. 10	Jan. 3	0.02
Savage, Nev.	Jan. 8	Jan. 30	0.10
Scottish Chief, Utah	Dec. 9	Dec. 28	0.01
Sierra Nevada, Nev.	Dec. 30	Jan. 20	0.10
Silver Queen, Utah	Dec. 7	Dec. 24	0.01½
Surprise, Ida.	Dec. 11	Jan. 6	0.01½
Ultimo, Cal.	Dec. 2	Dec. 23	0.05
Wabash, Utah	Nov. 30	Dec. 23	0.03
West End, Utah	Nov. 3	Dec. 31	0.01½
Yellow Jacket, Nev.	Dec. 18	Jan. 23	0.25

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765	65.462	29.984	30.253
May	66.976	65.981	30.968	30.471
June	65.394	67.090	30.185	30.893
July	65.105	68.144	30.113	31.366
August	65.949	68.745	30.529	31.637
September	67.927	67.792	31.483	31.313
October	69.523	62.435	32.148	28.863
November	70.813	58.677	32.671	27.154
December	69.050	54.565	32.003	25.362
Year	66.791	65.327	30.868	30.188

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.260	84.793	98.625
May	18.475	24.048	18.724	25.072	84.867	102.375
June	18.442	22.665	18.719	24.140	83.994	97.272
July	18.190	21.130	18.585	21.923	81.167	95.01
August	18.380	18.356	18.706	19.255	83.864	79.679
September	19.033	15.565	19.328	16.047	87.831	68.375
October	21.203	13.169	21.722	13.551	97.269	60.717
November	21.833	13.391	22.398	13.870	100.270	61.226
December	22.885	13.163	23.350	13.393	105.226	60.113
Year	19.278	20.004	19.616	20.661	87.282	87.007

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	41.091
February	36.403	42.102	August	40.606	37.667
March	36.662	41.313	September	40.516	36.689
April	38.900	40.938	October	42.852	32.620
May	43.313	43.149	November	42.906	30.833
June	39.260	42.120	December	42 750	27.925
			Av. year	39.819	38.166

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350	6.000	15.922	19.703
April	5.404	6.000	15.959	19.975
May	5.685	6.000	16.725	19.688
June	5.750	5.760	16.813	20.188
July	5.750	5.288	16.525	20.350
August	5.750	5.250	17.109	19.063
September	5.750	4.813	18.266	19.775
October	5.750	4.750	19.350	18.531
November	5.750	4.376	19.281	17.281
December	5.900	3.658	19.609	14.500
Year	5.657	5.325	17.370	19.034

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

MONTH.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.087	6.685	5.931	6.535	25.781	25.900
May	5.997	6.441	5.846	6.291	27.000	25.563
June	6.096	6.419	5.948	6.269	27.728	25.469
July	6.006	6.072	5.836	5.922	26.800	23.850
August	6.027	5.701	5.878	5.551	26.938	21.969
September	6.216	5.236	6.056	5.086	27.563	21.050
October	6.222	5.430	6.070	5.280	28.075	21.781
November	6.375	4.925	6.225	4.775	27.781	21.438
December	6.593	4.254	6.443	4.104	27.938	20.075
Year	6.198	5.962	6.048	5.812	27.020	23.771

New York and St. Louis, cents per pound. London in pounds sterling per long ton.